Environmental Assessment for PROPOSED AMENDMENT TO REGULATIONS FOR GEOLOGICAL EXPLORATION OF THE COASTAL PLAIN 1002 AREA

U.S. Fish United States Fish and Wildlife Service
Arctic National Wildlife Refuge, Alaska

To Be moved to Section 6 before Forwarding
Current Assignments -

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15 November 2017

U.S. Fish & Wildlife Service

Environmental Assessment
For the
Proposed Regulation Change for Management of the Coastal Plain 1002 Area of the Arctic National Wildlife Refuge, Alaska

This Environmental Assessment (EA) was prepared in accordance with the U.S. Department of the Interior (DOI) Departmental Manual 516, and is in compliance with the National Environmental Policy Act and the Council on Environmental Quality Regulations (40 CFR 1500-1508).

This EA serves as a public document to briefly provide sufficient evidence and analysis for determining the need to prepare an Environmental Impact Statement (EIS) .

This EA concisely describes the need for the proposed land potential environmental impacts of the proposed action and the alternatives. The EA provides a list of the agencies and persons consulted during EA preparation.

Glossary	
1002 area	identified as such in the map entitled *Arctic National Wildlife Refuge*, dated August 1980 [ANILCA § 1002(b)] (See Figure 1).
ANILCA	Alaska National Interest Lands Conservation Act of 1980
BLM	Bureau of Land Management, U.S. Department of the Interior
CCP	Comprehensive Conservation Plan for National Wildlife Refuges, required by ANILCA
coastal plain	defined as that area shown on the map entitled Arctic National Wildlife Refuge dated August 1980 [ANILCA § 1002(b)], and legally described in 50 CFR § 37 Appendix I-Legal Description of the Coastal Plain, Arctic National Wildlife Refuge, Alaska [see also 50 CFR § 37.21.2] (See Figure 1).
cultural resource	defined as any district, site, building, structure, or object significant in American history, architecture, archeology, engineering or culture, as determined in accordance with 36 CFR § 60.6 [see 50 CFR § 37.21.2]
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior; including BLM, USFWS, USGS
EA	Environmental Assessment, as stipulated under NEPA
EIS	Environmental Impact Statement, as stipulated under NEPA
exploratory activity	defined as surface geological exploration or seismic exploration or both of the coastal plain and all related activities and logistics required for either or both, and any other type of geophysical exploration of the coastal plain which involves or is a component of an exploration program for the coastal plain involving surface use of refuge lands and all related activities and logistics required for such exploration [see 50 CFR § 37.21.2]
FONSI	Finding of No Significant Impact; Federal agency decision that concludes an EA
NEPA	National Environmental Policy Act of 1970 [40 CFR §§ 1500-1508]
NRC	National Research Council, National Academy of Sciences
NWR	National Wildlife Refuge
ROD	Record of Decision, Federal agency decision that concludes an EIS
USFWS	Fish and Wildlife Service, U.S. Department of the Interior
USGS	Geological Survey, U.S. Department of the Interior

Table of Contents

1 Introduction & Overview

1.1 Purpose and Need

The U.S. Fish and Wildlife Service (Service), proposes to amend the regulations at 50 CFR §§ 37 - *Geological and Geophysical Exploration of the Coastal Plain, Arctic National Wildlife Refuge, Alaska*, regarding the dates when an application may be submitted for a permit for a geological and geophysical exploration plan on the Arctic National Wildlife Refuge (Arctic Refuge) lands described in the Alaska National Interest Lands Conservation Act (ANILCA). This action is an update to our regulations to allow opportunities for applications to conduct seismic exploration. Further, the ability to collect new information on oil and gas resources will better inform public policy decisions. We are taking this action in support of Executive Order 13783, Promoting Energy Independence and Economic Growth.

1.2 Key Environmental Requirements & Integration of Other Environmental Statutes & Regulations

The *National Environmental Policy Act of 1969* (NEPA) requires federal agencies to integrate environmental values into their decision-making processes by considering the environmental impacts of their proposed actions and reasonable alternatives to those actions, including a no action alternative. This Environmental Assessment (EA) addresses the administrative action by the Service to permit new exploration plans in the Arctic Refuge. This EA does not evaluate decisions to issue special use permits for specific exploration plans as the details of those plans are unknown at this time. Any analysis by the Service at this time would be speculative in regards to methods, location and timing of the exploration activities.

Section 7 of the *Endangered Species Act* (16 U.S.C. 1536) requires the DOI Secretary to ''review other programs administered by him (or her) and utilize such programs in furtherance of the purposes of the Act'' and to ''insure that any action authorized, funded, or carried out is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of [critical] habitat . . . .'' Prior to issuance of these regulations, we would consult under section 7 of the Endangered Species Act of 1973, as amended (Act; 16 U.S.C. 1531 et seq.), to ensure that any applications for exploration in the 1002 area of Arctic Refuge is not likely to jeopardize the continued existence of any species designated as endangered or threatened, or modify or destroy its critical habitat, and that the regulations are consistent with conservation programs for those species. Similar to the NEPA analysis, plan-specific Section 7 reviews would be completed when explorations plans are submitted for review and processing.

The ANILCA is integral to how this regulation change will be evaluated. When ANILCA was passed in 1980 the Act re-designated Arctic Refuge and required the writing of a Comprehensive Conservation Plan (CCP) for the refuge (Title III), required the identification of federal actions which could have the potential to significantly restrict subsistence users (Title VIII), and required

the Interior "to provide for a comprehensive and continuing inventory and assessment of the fish and wildlife resources of the coastal plain of the Arctic Refuge; an analysis of the impacts of oil and gas exploration, development, and production, and to authorize exploratory activity within the coastal plain in a manner that avoids significant adverse effects on the fish and wildlife and other resources" (Title X). The "coastal plain" was defined by a map entitled "Arctic National Wildlife Refuge", dated August 1980 (Figure 1).

Wilderness Act …

Section 106 of the *National Historic Preservation Act of 1966* requires that federal agencies identify and assess the effects its actions may have on historic properties. "Properties" is broadly defined and does not just include built infrastructure. Prior to issuance of any permit given under these regulations, we would ensure that any applications for exploration in the 1002 area of Arctic Refuge is not likely to jeopardize historic properties.

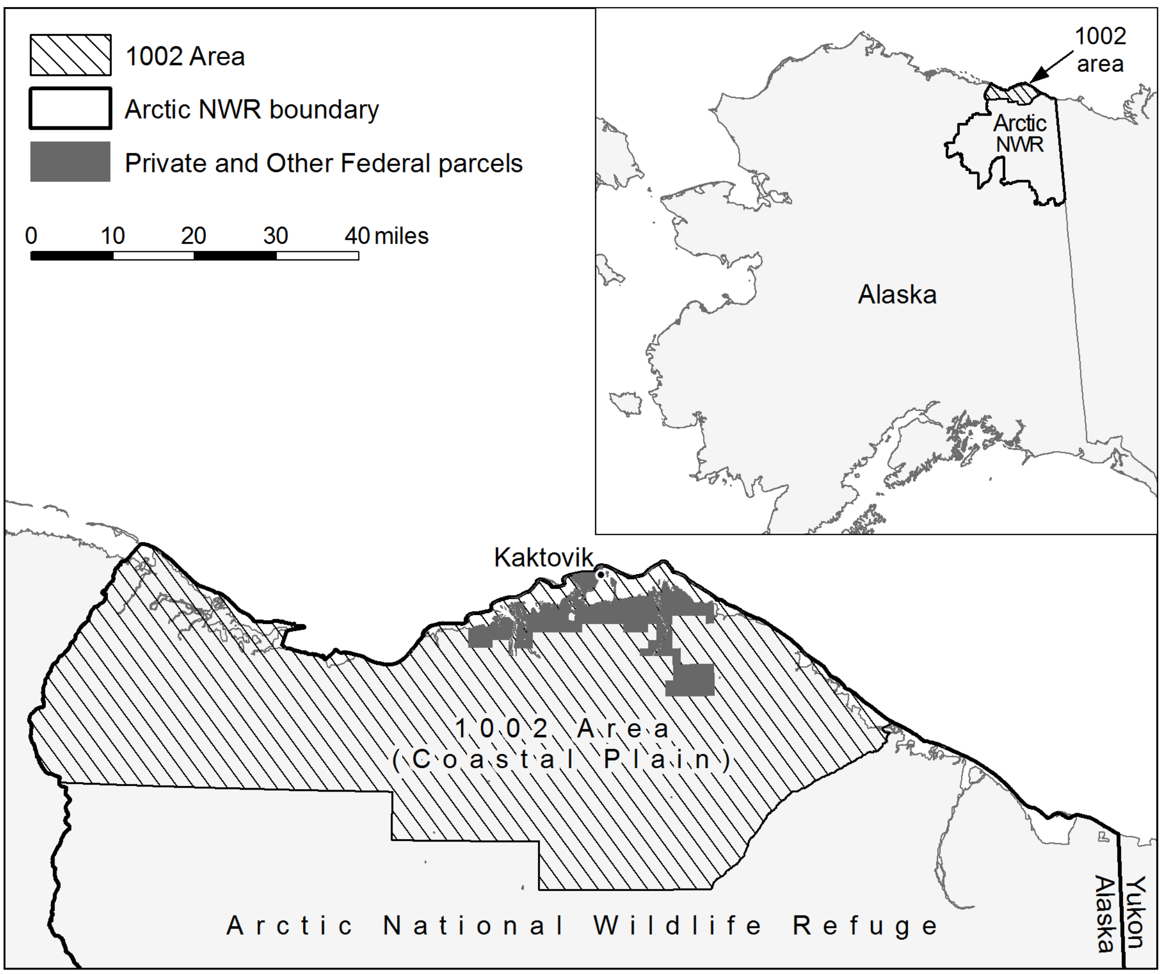

Figure 1. Arctic National Wildlife Refuge showing the coastal plain and 1002 area.

Arctic Refuge was first established in 1960 through Public Land Order 2214, for the purpose of preserving unique wildlife, wilderness, and recreational values. The original 8.9-million acre Range was withdrawn from all forms of appropriation under public land laws, including mining but not from mineral leasing.

In ANILCA Title III, Arctic Refuge was expanded to 19-million acres (Figure 1). Under ANILCA § 303(2) the "purposes for which the Arctic National Wildlife Refuge was established and shall be managed include –

(i) to conserve fish and wildlife populations and habitats in their natural diversity including, but not limited to, the Porcupine caribou herd (including participation in coordinated ecological studies and management of this herd and the Western Arctic caribou herd), polar bears, grizzly bears, muskox, Dall sheep, wolves, wolverines, snow geese, peregrine falcons and other migratory birds and Arctic char and grayling;

(ii) to fulfill the international treaty obligations of the United States with respect to fish and wildlife and their habitats;

(iii) to provide, in a manner consistent with the purposes set forth in subparagraphs (i) and (ii), the opportunity for continued subsistence uses by local residents; and

(iv) to ensure, to the maximum extent practicable and in a manner consistent with the purposes set forth in paragraph (i), water quality and necessary water quantity within the refuge."

In Title VIII, § 810, Congress recognized the importance of federal lands to local residents of Alaska who had been using those lands to support their subsistence lifestyle for generations. As a result, federal land managers are required to identify whether a proposed land management action has the potential to significantly restrict subsistence opportunities. If so, then the manager is required to consult with local subsistence users and to seek to minimize such restrictions. In Title X, § 1002, Congress provided for a "comprehensive and continuing inventory and assessment of the fish and wildlife resource of the coastal plain of the Arctic Refuge; an analysis of the impacts of oil and gas exploration, development, and production, and to authorize exploratory activity within the coastal plain in a manner that avoids significant adverse effects on the fish and wildlife and other resources."

1.3 Background

With the passage of ANILCA, three primary actions were required of the Service and DOI in relation to administration of the Arctic Refuge: (1) a CCP for the Arctic Refuge was to be written; (2) the Secretary was to assess wildlife values and oil reserves in an area described in ANILCA § 1002; and, (3) the Secretary was to authorize exploratory activity within the coastal

plain "in a manner that avoids significant adverse effects on the fish and wildlife and other resources."

First, ANILCA § 304(g) directed the preparation of a CCP for each refuge in Alaska. Each plan is based on an identification and description of resources of the refuge, including fish and wildlife resources and wilderness values, and must "designate areas within the refuge according to their respective resources and values; specify programs for conserving fish and wildlife and the programs relating to maintaining the identified values proposed to be implemented within each such area; and specify uses within each area which may be compatible with the major purposes of the refuge."

An initial CCP and related EIS were prepared for Arctic Refuge. The Record of Decision (ROD) implemented the minimal management alternative (FWS 1988a, 1988b) which emphasized managing for natural, unaltered landscapes and natural processes. This decision was reiterated in 2015 when the CCP was revised. In this updated CCP and EIS, recommendations for Congressionally-designated Wilderness and four additional Wild and Scenic River designations were also included (FWS 2015a).

Second, under ANILCA § 1002 the Secretary was required to assess the petroleum and wildlife values for a 1.5 million-acre portion of Arctic Refuge coastal plain referred to as the "1002" area (Figure 1). The assessment of the 1002 area was essential to identifying potential oil and gas reserves and whether development activities would significantly and adversely affect fish, wildlife, habitats or the environment.

Biological studies and geological exploration coordinated by the Service, U.S. Geological Survey (USGS), and Bureau of Land Management (BLM) over a 2-year period on the coastal plain were initiated shortly after the enactment of ANILCA. Studies were to conclude 5 years after enactment of the Act, with final results and recommendations submitted to Congress 9 months later.

In April 1982, the Service completed the initial report summarizing current information regarding fish and wildlife, and their habitats occurring on the Arctic Refuge coastal plain (FWS 1982). Between 1982 and 1987 over 50 separate biological field studies in the 1002 area have documented baseline conditions, most summarized in annual reports (Garner and Reynolds 1983, 1984, 1985, 1986, 1987). The baseline assessment period ended in 1987 with the submittal of the *Arctic National Wildlife Refuge, Alaska, Coastal Plain Resources Assessment: Report and Recommendation to the Congress of the United States and Final legislative Environmental Impact Statement* (hereafter, *Coastal Plain Report*) (Clough and others 1987). The recommendation to Congress at the time was to open the entire 1002 area to an orderly oil and gas leasing program and in such circumstances as warranted, avoid unnecessary adverse effects on the environment (Secretary of the Interior Recommendation pp. 182-192 in Clough and others 1987).

Baseline biological and water resource assessment in or near the 1002 area continued from 1988 through 2002, coordinated among the USFWS, USGS, BLM, Alaska Department of Fish and

Game, Canadian Wildlife Service, Yukon Department of Renewable Resources, Northwest Territories Department of Resources, Wildlife, and Economic Development, and academic institutions (Truett 1990; McCabe and others 1992; FWS 1994; Douglas and others 2002). Since 2002, biological studies have become increasingly landscape oriented, focusing on ecosystem processes and functions (Martin and others 2009).

Concurrent with the biological studies, oil and gas resource exploration and assessment were ongoing in the 1002 area but ended with the submission of the 1987 *Coastal Plain Report* (Bird and Magoon 1987; Clough and others 1987; FWS 1990; GAO 1993). The Coastal Plain Report concluded that the 1002 area was potentially rich in oil and gas resources. Based on the findings, there is a 95 percent chance the 1002 area contains more than 4.8 billion barrels of oil and 11.5 trillion cubic feet of gas in-place (Clough and others 1987). There is a 19 percent chance that economically recoverable oil occurs on the 1002 area. The average of all estimates of conditional economically recoverable oil resources is 3.2 billion barrels (Clough and others 1987).
Finally, in order to conserve the wildlife resources of the area Congress outlined guidance in § 1002(d) for the Department to authorize exploration plans and to develop regulation for these geological exploratory activities to ensure these activities do not significantly adversely affect fish and wildlife and their habitats, or the environment. Some of the requirements included a prohibition on the carrying out of exploratory activity during caribou calving and immediate post-calving seasons or during any other period in which human activity may have adverse effects; temporary or permanent closing of appropriate areas to such activity; specification of the support facilities, equipment and related manpower that is appropriate in connection with exploratory activity; and, requirements that exploratory activities be coordinated in such a manner as to avoid unnecessary duplication.

In April 1983, DOI published the final 50 CFR §§ 37 (DOI 1983; FWS 1983). This regulation defines the general provisions for geological and geophysical exploration within the coastal plain of Arctic Refuge, including: purpose and definitions [Subpart A]; general requirements for exploratory activities [Subpart B]; exploration plans and the application process [Subpart C]; environmental protection to avoid significant adverse impacts to natural and cultural resources [Subpart D]; general administration [Subpart E]; and, reporting and data management to preclude unnecessary duplication [Subpart F].

In this rule, three permit application openings were established as described in Table 1. Each application opening allowed either continued work from a previous work session or new work to begin in the upcoming work session. All exploration work, regardless of when it was initiated, was to be completed by May 31, 1986. No new exploration plans have been accepted since 1984 and no new exploration work has occurred since 1986.

Table 1-1. Exploration Work Sessions and Their Respective Application Due Dates as Stipulated in 50 CFR 37.21.

Type of Exploration Work	**Exploration Work Sessions as Allowed in 50 CFR 37.21**	**Applications Due**

Any exploration plans	April 19, 1983 – May 31, 1986	May 20, 1983
Exploration plans other than seismic exploration	June 1, 1984 – May 31, 1986	April 2, 1984
Any exploration plans	October 1, 1984 – May 31, 1986	June 4, 1984

1.4 Agency and Public Involvement

1.5 Government-to-Government Consultation with Federally Recognized Tribes

In compliance with Executive Order 13175, Consultation and Coordination with Indian Tribal Governments, federal agencies are required to consult with federally recognized tribal governments during the NEPA process. The Service identified tribal governments potentially affected by the project. Tribal governments will be invited to consult on this regulation change. Additional consultation will occur prior to issuance of any permit for exploration activities on the Arctic Refuge.

1.6 Summary of Issues

In order to clarify the issues of greatest concern, the following two tables describe the issues being dismissed and further considered in this EA. If an issue has been dismissed, a reason is given in Table 1-2. The issue will not be discussed further in the document. Issues being further considered are listed in Table 1-3. These issues will be further discussed in Chapter 3 Affected Environment and Chapter 4 Environmental Consequences.

Table 1 - 3: Issues Dismissed from Further Evaluation

Affected Environment	Reason for Not-Evaluating
Geology	Neither the change in regulation or the resulting exploration activities, which are non-extractive, will change the geology of the area.
Air Quality	
Marine Mammals, not including Polar Bears and Bowhead whales	

Migratory Birds	Winter seismic exploration concluding around 1 May should have negligible, if any, impacts on migratory birds which arrive later in the month on the coastal plain.
Steller and spectacled eiders	As migratory birds, neither of these threatened eiders would occupy breeding habitat during the period of winter exploration. Even if there were temporal overlap, only the very NW corner of the 1002 area is within the breeding range of the spectacled eider, and they only occur there as a rare breeder at very low densities. Steller's eiders do not breed in the 1002 and are just a rare visitor along the coast.

Table 1 - 4: Issues Considered for Further Evaluation

AFFECTED ENVIRONMENT	REASON FOR FURTHER EVALUATION
Soils	Although the overall geology of the coastal plain would not be affected, the development of ice roads and ice pads and other associated infrastructure may expose areas to erosion. There is also a risk of fuel spills from equipment being used.
Hydrology	
Climate	Although climate will not be affected by either of the alternatives directly, a description of past and present climate is useful in considering cumulative effects of the proposed action to other resources. For this reason a description of climate trends is included in Chapter 3.
Vegetation	In any proposed industrial activity on Arctic Refuge, there is a concern that invasive species will be introduced. We are also concerned about the effects of the development ice roads and ice pads and other associated infrastructure may create.
Wetlands	Depending on the amount of water needed for the development of ice roads and pads, water available for healthy wetlands may be affected.
Fish	
Bald and Golden Eagles	Golden Eagles are rare breeders on the coastal plain, and initiate nesting very early in the spring on the North Slope (earliest of 23 March, with three annual mean initiation dates of 5 April, 14 April, and 22 April); thus, could be affected by "winter" seismic exploration. Bald Eagles are probable, but very rare, breeders on the coastal plain.
Resident Birds	Gyrfalcons are rare breeders on the coastal plain, and initiate nesting very early in the spring; thus, could be affected by seismic exploration. Their primary late winter/early spring prey are rock and willow ptarmigan which are uncommon and common permanent residents, respectively, on the coastal plain.
Caribou	The coastal plain is within the territory of the Porcupine Caribou Herd which travels north and south and is a primary subsistence resource for many of the Native people who live in and around the Refuge.

Terrestrial Mammals, Not Including Caribou	Both muskox and moose are now rare on the coastal plain; their populations have declined in recent years. Muskox may be particularly sensitive to late winter disturbance given nutritional challenges and calving beginning in mid-April. Bears, wolves, and wolverines all occur on the coastal plain, although they are more abundant in the foothills and mountains. Brown bears emerge from their dens from late March through May; this period could well overlap seismic exploration periods.
Polar Bears	A majority of female polar bears of the Southern Beaufort Sea population now den on the Refuge coastal plain. As a result much of the area has been designated critical habitat.
Bowhead Whale	Now that there is limited sea ice during much of the year, exploration equipment could be transported to the area via barges through a known bowhead whale migration corridor.
Cultural Resources	The reverberation created by seismic exploration is known to damage buried artifacts.
Socioeconomic	Exploration activities do have the potential to create employment opportunities within communities neighboring the Refuge and may also affect subsistence resource availability.
Environmental Justice	Under EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, federal agencies are required to develop strategies to address environmental justice concerns in their approach to operations.
Subsistence	Exploration activities have the potential to affect resource availability by creating disturbances that change caribou and polar bear movements.
Land Use	The development of any semi-permanent developments in the Coastal Plain may require a change to the land management status from "Minimal" to "Moderate" management.
Visitor Experience Opportunities	
Noise/Soundscape	The resulting exploration activities will require a significant level of industrial activity during the exploration work season. Noise, depending on the level, can be disturbing to local wildlife and individuals using the area.

2 Proposed Action and Alternatives

2.1 Alternative 1 (No Action Alternative)

Under the no action alternative, the existing regulation would not be amended or updated. Management of the Coastal Plain, Arctic Refuge, would continue as presently and as stipulated in the ROD for the Arctic Refuge CCP (FWS 2015). There would continue to be no oil and gas exploration on Arctic Refuge.

2.2 ALTERNATIVE 2 - PROPOSED ACTION

The Service proposes to allow opportunities for applications to conduct seismic exploration by amending and updating the regulatory language of 50 CFR §§ 37 - *Geological and Geophysical Exploration of the Coastal Plain, Arctic National Wildlife Refuge, Alaska*, specifically § 37.21(b) and (c) as follows:

PART 37 – GEOLOGICAL AND GEOPHYSICAL EXPLORATION OF THE COASTAL PLAIN, ARCTIC NATIONAL WILDLIFE REFUGE, ALASKA

Subpart C – Exploration Plans

§ 37.21 Application Requirements.

(a) Prior to submitting an exploration plan, applicants may meet with the Regional Director to discuss their proposed plans and exploratory activities and the requirements of this part.

(b) Any person wanting to conduct exploratory activities may apply for a special use permit by submitting for approval one or more written exploration plans, in triplicate, to the Regional Director, Region 7, U.S. Fish and Wildlife Service, 1011 East Tudor Road, Anchorage, Alaska 99503.

(c) In addition to containing the information required in paragraph (d) of this section, any exploration plan submitted shall describe the applicant's plan for carrying out an integrated program of exploratory activities in such a manner as will satisfy the objective and limitations stated in § 37.1. If an applicant submits an exploration plan in any given year with the intention of submitting another exploration plan the following year, the applicant shall describe in its initial plan how its future exploratory activities will be integrated with those proposed under its initial plan. Each exploration plan submitted must be published and be the subject of a public hearing in accordance with requirements of § 37.22(b).

(d) An exploration plan shall set forth in general terms such information as is required by this part and by the Regional Director in determining whether the plan is consistent with this part, including, but not limited to:

(1) The name and address of any person who will conduct the proposed exploratory activities, i.e., the applicant/permittee, and, if that person is an agency, firm, corporation, organization, or association, the names and addresses of the responsible officials, or, if a partnership, the names and addresses of all partners;

(2) The names and addresses of all persons planning at the time of plan submittal to participate in the proposed exploratory activities or share in the data and information resulting therefrom through a cost-sharing or any other arrangement;

(3) Evidence of the applicant's technical and financial ability to conduct integrated and well-designed exploratory activities in an arctic or subarctic

environment and of the applicant's responsibility in complying with any exploration permits previously held by it;

(4) A map at a scale of 1:250,000 of the geographic areas in which exploratory activities are proposed and of the approximate locations of the applicant's proposed geophysical survey lines, travel routes to and within the refuge, fuel caches, and major support facilities;

(5) A general description of the type of exploratory activities planned, including alternate exploratory methods and techniques if proposed, and the manner and sequence in which such activities will be conducted;

(6) A description of how various exploratory methods and techniques will be utilized in an integrated fashion to avoid unnecessary duplication of the applicant's own work;

(7) A schedule for the exploratory activities proposed, including the approximate dates on which the various types of exploratory activities are proposed to be commenced and completed;

(8) A description of the applicant's proposed communication techniques;

(9) A description of the equipment, support facilities, methods of access and personnel that will be used in carrying out exploratory activities;

(10) A hazardous substances control and contingency plan describing actions to be taken to use, store, control, clean up, and dispose of these materials in the event of a spill or accident;

(11) A general description of the anticipated impacts that the proposed exploratory activities may have on the refuge's wildlife, its habitat, the environment, subsistence uses and needs, and cultural resources, and a description of mitigating measures which will be implemented to minimize or avoid such impacts;

(12) A description of the proposed procedures for monitoring the environmental impacts of its operation and its compliance with all regulatory and permit requirements;

(13) A statement that, if authorized to conduct exploratory activities, the applicant shall comply with this part, its special use permit, its approved exploration plan, plan of operation, and all reasonable stipulations, demands and orders issued by the Regional Director;

(14) A description of the applicant's proposed data quality assurance and control program; and

(15) Such other pertinent information as the Regional Director may reasonably require.

Per 50 CFR 37.

2.3 IMPACT SUMMARY MATRIX

A summary of the impacts of the alternatives is presented in Table 2-4.

Table 2 - 4: Summary of Anticipated Impacts

AFFECTED ENVIRONMENT	NO ACTION - ALTERNATIVE 1	OIL & GAS EXPLORATION ALLOWED – ALTERNATIVE 2
Soils		
Hydrology		
Climate		
Vegetation		
Wetlands		
Fish		
Bald & Golden Eagles		
Migratory Birds		
Steller's and spectacled eiders		
Caribou		
Polar Bears		
Bowhead Whale		
Cultural Resources		
Socioeconomic		
Environmental Justice		
Subsistence		
Land Use		
Visitor Experience Opportunities		
Noise/Soundscape		

2.4 RECOMMENDED CONSERVATION MEASURES

Conservation measures are strategies that are implemented in order to minimize the effects to refuge resources by a project being implemented on the Refuge. Conservation measures for this project are listed in Table 2-5.

Table 2 - 5: Conservation Measures to be Required

AFFECTED ENVIRONMENT	CONSERVATION MEASURES
Soils	
Hydrology	
Climate	
Vegetation	
Wetlands	
Fish	
Bald & Golden Eagles	
Migratory Birds	
Steller's and spectacled eiders	
Caribou	
Polar Bears	
Bowhead Whale	
Cultural Resources	
Socioeconomic	
Environmental Justice	
Subsistence	
Land Use	
Visitor Experience Opportunities	
Noise/Soundscape	

2.5 ALTERNATIVES CONSIDERED BUT DISMISSED

No other alternatives were considered in this EA, because only a change of regulation will allow opportunities for applications to conduct seismic exploration. The Service considered updating the environmental protection requirements of 50 CFR sections 37.31 and 37.32, but determined that the regulations as currently written provide adequate protection of refuge resources.

3 Affected Environment

Per ANILCA § 1002(c), resource assessment baseline studies within the 1002 area began shortly after its enactment and, as stipulated, are "continuing." Special emphasis was placed on caribou, wolves, wolverines, grizzly bears, migratory waterfowl, muskox, and polar bears of the coastal plain and their habitat. The purpose of the studies was to "assess the size, range, and distribution of the populations of fish and wildlife; determine the extent, location, and carrying capacity of

the habitats of the fish and wildlife; assess the impacts of human activities and natural processes on the fish and wildlife and their habitats; analyze the potential impacts of oil and gas exploration, development, and production on such wildlife and habitats; and analyze the potential effects of such activities on the culture and lifestyles (including subsistence) of affected Native and other people."

The environmental setting, flora and fauna, water resources, cultural resources, and rural lifestyles (including subsistence) of the 1002 area of the coastal plain, Arctic Refuge, are generally defined and described in the *Final EIS and Preliminary Final Regulations: Proposed Oil and Gas Exploration within the Coastal Plain of the Arctic NWR* (DOI 1983), and *Coastal Plain Report* (Clough and others 1987).

Additional natural, water and cultural resource data and assessments are provided in the numerous studies conducted under the Arctic Refuge Coastal Plain Resource Assessment over the past 30 years (FWS 1982; Garner and Reynolds 1983, 1984, 1985, 1986, 1987; McCabe and others 1992; Douglas and others 2002; among others). Cumulative effects of oil and gas activities on the Alaska North Slope were reviewed by National Research Council, as these effects were not adequately integrated into ongoing studies up to that point (NRC 2003).

Since 1988, the natural and cultural resources, water resources, and lifestyles (including subsistence) in the Arctic Refuge, including the 1002 area, have been minimally managed by human influence or intrusion, and administered for their wilderness values and natural processes (FWS 1988a, 1988b, 2015a, 2015b).

Figure 3 - 1: Area of Influence

[Include map]

3.1 PHYSICAL ENVIRONMENT

3.1.1 Soils

Soils in the coastal plain are described in the 2012 Arctic Refuge CCP as including "low terraces and floodplains of streams draining the North Slope of the Brooks Range. Materials underlying soils in this region consist of fluvial sands and silts, with increasing amounts of interstratified marine sediments near the coast. Generally, soils…thaw less than 18 inches in summer and are poorly drained. Loamy textures are common on terraces and floodplains, and organic soils occur in depressions. Locally, peaty materials are buried beneath windblown sand deposits."

3.1.2 Hydrology

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3.1.3 Climate

The North Slope is defined as the area north of the Brooks Range, including the Beaufort Sea Coastal Plain and the Brooks Range Foothills ecoregions. The climate of the North Slope is classified as arctic: summers are short and cool, and winters are long and cold. The growing season lasts from June to August. Subfreezing temperatures and snow may occur at any time during the year.

The Arctic coast experiences more frequent cloudiness and fog with higher winds; inland, clear skies are more common, winds are variable, and summers are warmer and less cloudy with increasing distance from the coast. At Barter Island on the coast, temperatures average 40 °F in July (warmest month) and -20 °F in February (coldest month) (Table 4-2). Temperatures on the coastal plain and in the northern foothills of the Brooks Range are more similar to those measured at weather stations at Kuparuk and Toolik Lake, ranging from means of 47 to 53 °F in July and -18 to -6 °F in February.

North of the Brooks Range, the Refuge receives little precipitation. The average annual water equivalent precipitation is less than 10 inches (in), most of which falls as summer rainfall, but it includes 32 to 46 in of snowfall. Evaporation rates are low due to low temperatures and a short growing season; the land is underlain by continuously frozen soil, which restricts soil drainage. Therefore, available soil moisture is considerably greater than the low annual precipitation would produce in a more temperate climate, and soils are usually saturated during summer.

Surface winds along the Arctic coast average 9 to 15 miles per hour (mph), with occasional intense storms generating winds exceeding 70 mph. Winds are predominantly from the northeast, although the strongest winds come from the west. September and October are the windiest months on the coast, probably due to maximum amounts of open water (Wendler et al. 2010).

The Arctic is particularly sensitive to warming due to the historically extensive snow and ice cover, where the freezing point marks a critical threshold for stability of the landscape and thus both habitat and infrastructure sustainability. Accelerated melting of multiyear sea ice, reduction of terrestrial snow cover, and permafrost degradation are examples of the observed rapid Arctic-wide response to global warming.

Annual average near-surface air temperatures across Alaska and the Arctic have increased over the last 50 years at a rate more than twice as fast as the global average temperature (Taylor et al. 2017). There is limited meteorological monitoring on the north slope, and no long term, continuous monitoring in the Arctic Refuge. Thus, long term trends are derived primarily from Utqiagvik (Barrow). Especially strong warming has occurred over Alaska's North Slope during autumn. For example, Utqiagvik's (formally Barrow) warming since 1979 exceeds 7°F (3.8°C) in September, 12°F (6.6°C) in October, and 10°F (5.5°C) in November (Wendler et al. 2014).

Our understanding of precipitation trends are limited on the North Slope, in part because the difficulty of collecting rain and snow in windy sites makes historical precipitation data less reliable than temperature data. Overall, the 2016 May Alaska statewide snow coverage was the

lowest on record dating back to 1967; the snow coverage of 2015 was the second lowest, and 2014 was the fourth lowest (Taylor et al. 2017). The length of the snow season impacts the timing available for winter exploration activities as well as the timing of wildlife activities, including occupancy of migration and birthing habitats. Snowpack in the Brooks Range, and glacier mass, affect water availability in rivers and lakes for both fish and wildlife habitat and in support of industrial development.
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Negative trends in precipitation were observed between 1950 and 1988 at Barter Island, on the Beaufort Sea coast in the center of the Arctic Refuge (Curtis et al. 1998; L'Heureux et al. 2004). Across six decades (1950-2010), researchers also observed a consistent decrease in winter precipitation at Utqiagvik (McAfee et al. 2013), which supported earlier analyses (L'Heureux et al. 2004). The Barter Island station, however, has not reported continuously since the late 1980s, so it cannot confirm recent trends at Barrow. At Bettles, in the western Brooks Range, there appears to be an increase in winter precipitation, with the difference from the Arctic Coastal Plain resulting from the Brooks Range acting as a barrier to moisture transport.

3.2 Biological Environment

3.2.1 Vegetation

North of the Brooks Range, the coastal plain is treeless tundra, composed mainly of hardy dwarf shrubs, sedges, and mosses. Habitats on the North Slope can be grouped into four broad categories: coastal lagoons, lowland wet tundra and lakes, upland moist tundra, and river floodplains with willow shrub thickets. A detailed description of all the habitats on the Refuge can be found in the 2012 Refuge CCP. The following is a summary of the information found there as it pertains to the Refuge coastal plain.

Shrub thicket habitat can be categorized into two types: dry and moist prostrate dwarf shrub. Dry prostrate dwarf shrub occupies dry areas of the coastal plain tundra and on dry, infrequently-flooded river terraces or alluvial fans throughout the refuge. Moist habitats on slightly elevated microsites of the coastal plain are often drier as a result of greater exposure to wind and lack of water from surrounding terrain. Lichen are more common than mosses in these drier habitats. Bare soil as a result of frost action is common in this habitat type. Moist prostrate dwarf shrub contains similar shrub species as dry, but greater winter snow cover and summer soil moisture allows grasses, sedges, and mosses to thrive in the understory.

The riparian shrub type develops on gravels along rivers and is dominated by the willows *Salix planifolia* and *S. alaxensis*. On the North Slope, this is the tallest vegetation type. Species composition and density is controlled by frequency of flooding, water velocity, and the size of particles deposited during flooding

The very wet graminoid vegetation type occurs on aquatic habitats surrounding large, open bodies of fresh water, very wet habitats that contain numerous small bodies of open water; and coastal marshes frequently inundated with salt water. Surface forms includ low-centered polygons with abundant standing water, thaw lake basins, edges of lakes, and lowbank coastline.

There is usually little shrub, forb, or moss cover, except on drier microsites such as polygon rims.

3.2.2 Wetlands

3.2.3 Fisheries

Two types of fish habitat dominate the Arctic coastal plain: streams and lakes. Lake habitats may be isolated and without upstream or downstream connections, and may be further defined as deep or shallow. Environmental extremes also dominate fish habitats, between freezing, i.e., below 0°C/32°F during the long winter and flowing waters (above 0°C/32°F) during the short summer months. This combination, along with size, location, and morphology, including chemical and physical characteristics of the numerous lakes and tributaries of the Arctic coastal plain determine the distribution, densities and diversity of fish species (see Affected Environment - Hydrology 3.1.2).

Fish species may be categorized into freshwater residents, diadromous (both marine and freshwater) and marine. About 62 marine and diadromous fish occur in in the Beaufort Sea adjacent to the coastal plain and these species include Arctic char, Arctic cisco, Arctic flounder, boreal smelt, Pacific salmon (pink and chum), and fourhorn sculpin (Craig 1984; Clough and others 1987; Gallaway and Fechhelm 2000; BLM 2012). Nearshore marine environments provide important foraging and spawning habitats while the moving waters of river deltas provide overwintering habitat for some species. About 21 species of freshwater fish, including diadromous species that are predominantly freshwater, occur in the coastal plain and include Arctic lamprey, Arctic grayling, round whitefish, broad whitefish, ninespine stickleback, and burbot (Clough and others 1987; Moulton and George 2000; BLM 2012).

The 3- to 4-month Arctic summer is a critical period for fish to find quality foraging habitats and food resources and reproduce. It may be safely assumed that any fresh waters deeper than 2-2.5 meters (6-7 feet) deep, or alternatively below the maximum winter ice depth of the coastal plains environs may be suitable wintering habitat for fish (Bilello and Bates 1969, 1971, 1972, 1975 in Lyons and Trawicki 1994; Schmidt and others 1989; Moulton and George 2000). This type of habitat is considered restricted and a limiting factor to overwintering fish survival (Reynolds 1997). Large lakes are generally uncommon in the 1002 area of the coastal plain, and particularly those with overwintering capacity; do not freeze to the bottom during winter months, provide sufficient dissolved oxygen, and/or without salt water intrusion (Clough and others 1987).

Springs are important for spawning, rearing, and overwintering and these sites are generally more abundant and diverse than other waters for aquatic invertebrates as food resources (Glesne and Deschermeier 1984; Clough and others 1987).

The integrity of riparian areas is important for maintenance of water quality and fish populations on the coastal plain, more so at higher elevations where stream meandering during spring

snowmelt or summer storm events is less prevalent than at lower elevations (Clough and others 1987).

Grayling are not as tolerant of brackish waters and occur more in riverine systems than char but are in large concentrations are only a few locations. Grayling make extensive migrations to and from spawning, rearing, foraging, and overwintering locations (West and Wiswar 1985; Mecklenburg and others 2002). Major Arctic grayling populations occur in the Canning, Tamayariak, Sadlerochit, Hulahula, Okpilak, and Aichilik Rivers. Arctic char (Dolley Varden) are primarily anadromous but rely on freshwater habitats for spawning, early rearing, and wintering. Therefore, char also migrate with primary movement corridors in the Canning, Aichilik and Hulahula Rivers. The Canning River has the largest char run and the Hulahula is the most important for subsistence purposes.

Smaller fish species which have little interest for sport or subsistence, are important food resources for birds, mammals and other fish.

Seventeen of the most commonly occurring fish species in the coastal plain are important subsistence resources (NRC 2003). Due to difficulty of access and seasonal restrictions, sport fishing may be considered minimal in the coastal plain (Clough and others 1987; BLM 2012). Arctic char is the most important subsistence freshwater fish species followed by Arctic grayling.

3.2.4 Bald and Golden Eagles

Bald eagles are considered a casual visitor on the coastal plain (Arctic Refuge CCP) but recent observations suggest that they may be more accurately considered a very rare possible breeder in the 1002 area (T. Swem, pers. comm.). Golden eagles, on the other hand are fairly common visitors on the coastal plain, and rare breeders on the inland coastal plain (Arctic Refuge CCP). Across the entire Arctic Coastal Plain, overall golden eagle numbers in spring increased significantly between 1986 and 2012 at an annual rate of 7%; over the last decade of that period the increase was significant at an annual rate of 37% (Stehn et al. 2013). The mean annual index for golden eagles over the entire period was 118 birds, but in 2012, the index reached an all-time high of 522 (Stehn et al. 2013).

The 1002 area is very important for non-breeding golden eagles, particularly subadults, which both scavenge and prey upon caribou during the calving and post-calving period of the Porcupine herd (Mauer 1985). Although none of the nest sites visited by Mauer (1985) and his colleagues were within the 1002 area, subsequent observations have confirmed them as a breeding species there, including at nest sites within core calving areas (T. Swem, pers.comm.).

Within the refuge, golden eagles breeding north of the crest of the Brooks Range begin nesting very early in spring. Based on a three-year study (1988-1990), nest initiation dates in those golden eagles ranged from 23 March to 11 May, with annual mean nest initiation dates of 22 April, 14 April, and 5 April in 1988, 1989, and 1990, respectively (Young et al. 1995). Those dates would include the last third of the operations phase and the entirety of the demobilization phase of a recently-proposed winter seismic exploration project farther west on the North Slope

(BLM CPAI-NPR- A Final Seismic Environmental Assessment, 2016). Elsewhere, disturbance and development correlated with reduction in golden eagle nest success (Kochert et al. 2002); winter seismic activity could have similar result.

3.2.5 Resident Birds

Four species of birds are considered permanent residents of the coastal plain: Willow Ptarmigan, Rock Ptarmigan, Gyrfalcon, and Common Raven (Arctic NWR CCP). Gyrfalcons are an uncommon resident of the inland coastal plain (Arctic NWR CCP); eyries are known in the 1002 area (T. Swem, pers. comm.). Even in the middle of winter, gyrfalcons may be present on their nesting territories; in the coastal Northwest Territories of Canada (at latitudes comparable to, or greater than, those of the 1002 area), gyrfalcons have been found on territory as early as February (Booms et al. 2008). Both species of ptarmigan are important components of the gyrfalcon diet, particularly in winter and early spring when other prey types are either absent or scarce (Watson et al. 2012). Nest initiation dates range from early April to early June and, as with the Golden Eagle, early-nesting birds could be disturbed by winter seismic exploration during both the late operation and demobilization phases. Gyrfalcons are known to be disturbed by both fixed-wing aircraft and helicopter overflights; disturbed birds are less likely to use the same site in subsequent year (Booms et al. 2008)

3.2.6 Terrestrial Mammals other than Caribou

As established by ANILCA, the first purpose of the Arctic Refuge is to “conserve fish and wildlife populations and habitats in their natural diversity.” Among the wildlife species specifically listed in ANILCA under this purpose are several species of large terrestrial mammals including caribou, Dall sheep, muskox, moose, brown bear, wolf, and wolverine. Caribou will be considered in the next section; Dall sheep do not occur on the coastal plain. Among the five species which do occur in that region, both muskox and moose have experienced marked population declines over the last few decades. After muskox were reintroduced to the North Slope in the Arctic Refuge in 1969 and 1970, the population grew steadily and rapidly from 1978 to 1985 and then remained relatively stable until nearly the end of the century. Beginning in 1998, however, numbers dropped dramatically for the next half decade and have remained very low ever since. The overall muskox population in northeast Alaska and northwest Canada peaked in 1993 and has declined since then, but most of that decline is due to losses from the Arctic Refuge. Today, most of the muskox in the area are either west or east of the Arctic Refuge (Arctic Refuge CCP).

Moose populations in northeast Alaska, including the Arctic Refuge, increased rapidly in the third quarter of the 20th century. From 1989-1994, however, moose in this region declined by at least 50%, leading to harvest closures on state lands. By the early 21st century, moose populations west of the refuge had started to increase, but the same pattern did not hold on the Arctic Refuge. Relatively few moose occur east of the Canning River on the coastal plain or in the foothills of the refuge. Because of concerns about the small population size, harvest restrictions have been implemented (Arctic Refuge CCP).

Of the two species, muskox is probably more vulnerable to potential disturbance on the coastal plain. Female muskox don’t breed until they are four or five years old, most only breed every other year (or less frequently), and produce just a single calf. They subsist on generally poor quality forage in the winter time, and to compensate, they conserve energy by reducing their winter activity. In addition, calves are born between mid-April and mid-May, 4-6 weeks before snowmelt and subsequent green-up produce nutritious forage. As a result, late winter is a time of high vulnerability, and if any muskox were in the vicinity of seismic exploration camps and activity, disturbance could dangerously impact their energy balance (Arctic Refuge CCP).

Grizzly bears, wolves, and wolverines all occur on the coastal plain, but are more common inland in the foothills and mountains of the Brooks Range. Among the three, bears may be the most vulnerable to disturbance. Throughout the Arctic, brown bears have low rates of reproduction. They exhibit a delayed age at first reproduction (nine years of age in the Arctic Refuge), mean litter size of two, high first-year mortality, and an interval between successful litters of greater than three years. In addition, they emerge from their dens from late March through May; females with cubs usually emerge before adult males (Arctic Refuge CCP). The den emergence period overlaps the late operation and entire demobilization phases of hypothetical winter seismic exploration. Human-bear conflicts would be possible at this time as recently-emerged and hungry bears are ranging widely in search of early spring food.

3.2.7 Caribou

Caribou are the most abundant large mammal in Arctic Refuge and are an important subsistence species for Iñupiat and Athabascan (Gwich’in) hunters. Caribou are also hunted and viewed by other visitors to the Refuge and are prey for brown bears and wolves.

Caribou have been present in northeastern Alaska and the northern Yukon since the early Pleistocene. Human use of caribou in the region may date back thousands of years. Remnants of caribou fences and corral structures used by the Gwich’in people are found throughout the current southern range of the Porcupine caribou herd (Warbelow et al. 1975).

Large caribou herds tend to migrate over long distances using seasonally available forage resources that are often widely distributed. Caribou move in response to changing weather conditions, biting and parasitic insect harassment, and predators. In arctic areas, caribou reproduction is highly synchronous and the majority of calving occurs in a two- to three-week period. Most adult females give birth to a single calf. Caribou calves are precocious, being able to stand and nurse within one hour after birth and follow their mothers within a few hours. The first 24 hours of life are critical, when a behavioral bond is formed between the calf and its mother. Disturbance of maternal groups on the calving grounds may interfere with bond formation and can increase calf mortality. After calving, small bands of cows with newborn calves gradually merge into larger groups and are joined by yearlings, barren females, and bulls arriving from wintering areas.

Summer weather conditions promote the emergence of mosquitoes, nose bots, warble flies, and other biting insects. Insect harassment drives caribou into densely packed groups. These post-

calving aggregations often move toward the Arctic coast or to higher elevations in the mountains to find relief from insects.

By August, large aggregations gradually dissolve into widely dispersed small groups that move slowly toward winter ranges. Breeding takes place en route, and by mid-November, caribou arrive in areas where they will spend the winter.

Four caribou herds live in northern Alaska. Two of these, the Porcupine and Central Arctic herds, consistently use Arctic Refuge seasonally or throughout the year. Caribou would be most susceptible to interaction and potential disturbance from winter exploration activities during their spring migration to calving grounds within the 1002 area and for those that overwinter in that area, including members of the Teshekpuk Herd.

Porcupine Caribou Herd

An iconic symbol of Arctic Refuge, this herd migrates hundreds of miles from wintering grounds to give birth on the coastal plain and northern foothills of Arctic Refuge and nearby Yukon Territory in Canada. Residents of Arctic Village and, to a lesser extent, Kaktovik, hunt Porcupine caribou. Many visitors come to Arctic Refuge during early summer with hopes of seeing large numbers of caribou.

During the 1960s and 1970s, the Porcupine caribou herd was relatively stable at about 100,000 animals. Numbers steadily increased after 1978, peaked at 178,000 in 1989, and declined to 123,000 caribou in 2001 (Lenart 2007). Between 2002 and 2009, no estimates of abundance were available. During this period, caribou left the coastal plain and northern foothills of Arctic Refuge earlier and did not form large post-calving aggregations, or weather conditions precluded flights to photograph groups (E. Lenart, wildlife biologist, ADFG, pers. comm.). In 2010, 169,000 caribou were counted in a photocensus of the Porcupine caribou herd (Caikoski 2011). Between 2001 and 2013 the herd increased to levels not seen since monitoring began in 1977, with an estimated population of 197,000 (ADFG 2017b).

The Porcupine caribou herd ranges over 130,000 square mi (337,000 square km) of wild lands in northeastern Alaska and northwestern Canada (Lenart 2007). The entire Arctic Refuge coastal plain is key calving and post-calving habitat for Porcupine caribou (Griffith et al. 2002). Foothills and mountains of Arctic Refuge are also important summer, fall, and winter habitats, as well as spring and fall migration routes. As the summer progresses and willows (Salix sp.) emerge, caribou also use riparian habitats. The Porcupine caribou herd generally overwinters south of the Brooks Range in Arctic Refuge and in the Richardson and Ogilvie mountains of the Yukon Territory, Canada. Winter distribution varies by year but is primarily south of the Brooks Range (Caikoski 2011).

Spring migration to calving grounds begins in mid-April and continues through May. Pregnant caribou move northward from wintering areas toward calving grounds, where they give birth during the first week in June. Timing and routes of migration vary annually depending on where they overwintered, snow conditions, and timing of the onset of spring weather. Caribou wintering in Alaska often follow a northeasterly route to calving grounds, crossing the southern

flanks and valleys of the Brooks Range, and eventually entering Canada near the Firth River. Caribou wintering in Canada also converge in this region. Some caribou wintering in Alaska move in a more northerly direction, crossing the eastern Brooks Range and traveling more directly toward calving grounds. As snowmelt progresses, caribou in the foothills spread northwestward along a broad front, primarily following the major river corridors and associated terraces where snow melt has advanced.

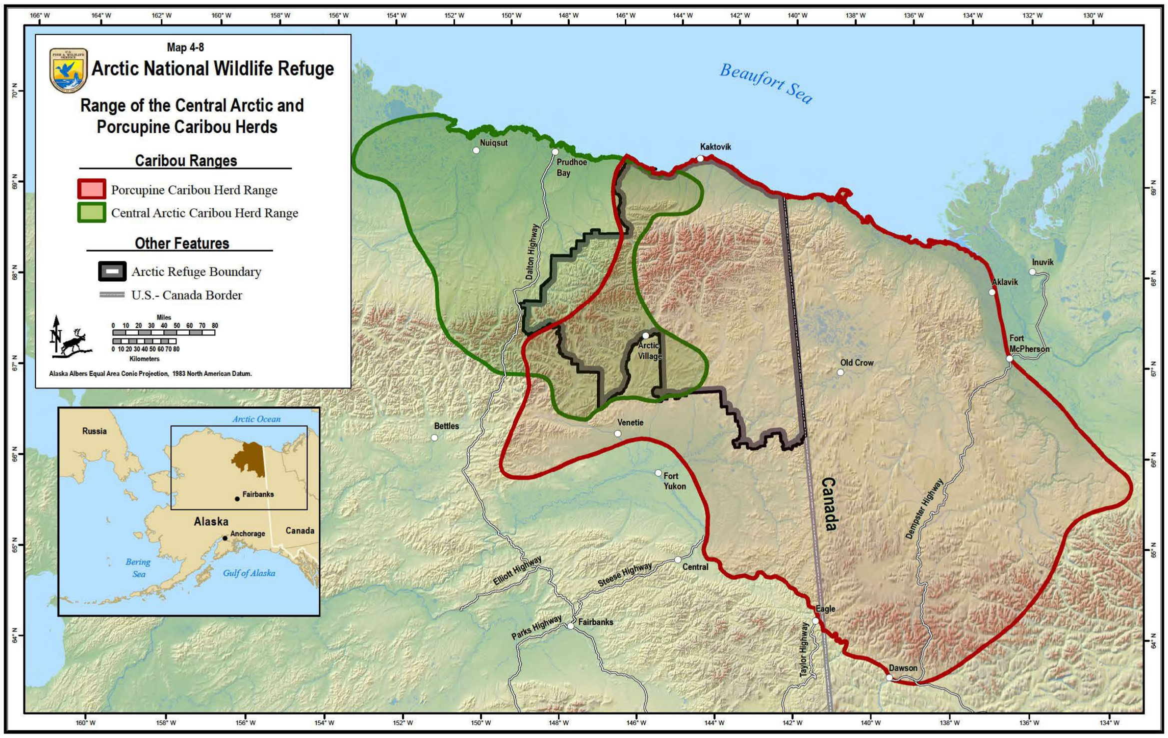
For the past few decades, the Porcupine caribou herd has calved in a region encompassed the Arctic foothills and the coastal plain from the Canning River in Arctic Refuge to the Babbage River in Canada, an area of nearly 8.9 million ac (3.6 million ha) (Griffith et al. 2002). During the calving season in early June, Porcupine caribou selected areas of wet sedge, herbaceous tussock tundra and riparian vegetation types (Griffith et al. 2002). Emerging tussock cotton grass (*Eriophorum vaginatum*) flowers were an important source of high quality forage in areas used by calving caribou (Jorgenson et al. 2002). This plant species had greater biomass and forage quality in tussock tundra compared with other vegetation types. The distribution of tussock tundra and moist sedge-willow tundra was greater in calving areas in the Arctic Refuge 1002 Area than in areas further south and east (Jorgenson et al. 2002).

Central Arctic Caribou Herd

The annual range of the Central Arctic caribou herd overlaps that of the Porcupine caribou herd. Two main calving concentration areas have been identified for the Central Arctic caribou herd: a western area between the Kuparuk and Colville rivers, and an eastern area between the Sagavanirktok and Canning rivers. The eastern area includes the Canning River delta region in northwest Arctic Refuge.

During most winters, scattered groups of animals range throughout the coastal plain west of the Katakturuk River and adjacent uplands to the south. Between 2002 and 2009, the winter distribution of the Central Arctic caribou was north and south of the Brooks Range in Arctic Refuge. In some years, they mixed with Porcupine caribou wintering in the same region. In 2010, almost all Central Arctic caribou wintered on the south side of the Brooks Range in Alaska, as did Porcupine caribou.

This herd had about 5,000 caribou in the mid-1970s when it was first identified as a distinct herd (Cameron and Whitten 1979). By the early 1980s, it had grown to almost 13,000 and by the late 1990s, when net calf production was greater than 70 percent calves per female, it increased to over 25000 (Cameron et al. 2002). A photocensus in 2010 counted more than 70000 caribou in the Central Arctic herd, but a late spring in 2013 resulted in high mortality and the population dropped to 50,000 animals (ADFG 2017a). A 2016 estimate showed further dramatic declines, and the population estimate decreased an additional 50% and is at less than 23,000 caribou. The declines are attributed to both high adult female mortality and mixing of the Central, Teshekpuk and Porcupine herds.



3.2.8 Polar Bear

Of the two polar bear subpopulations (or stocks) found in the United States, polar bears in the Southern Beaufort Sea (SBS) subpopulation are the most likely to occur in the 1002 area of the Arctic National Wildlife Refuge. The subpopulation is shared by the U.S. and Canada. The boundary of the SBS subpopulation, as recognized by the Polar Bear Specialists Group, is Icy Cape, Alaska to the west and south of Banks Island and east of the Baillie Islands, Canada to the east (Obbard et al. 2010). The SBS subpopulation had an estimated population size of approximately 900 bears in 2010 (Bromaghin et al. 2015). This estimate represents a significant reduction from previous estimates of approximately 1,800 in 1986 (Amstrup et al. 1986), and 1,526 in 2006 (Regehr et al. 2006). Although there was some evidence in the 2010 estimate that the population might be showing signs of the subpopulation beginning to increase (Bromaghin et al. 2015). Analyses of over 20 years of data on the size and body condition of bears in this subpopulation demonstrated declines for most sex and age classes (Rode et al. 2010, 2014).

Population declines and the size and body condition of bears in the SBS subpopulation have been linked to declining sea ice conditions in the Beaufort Sea (Regehr et al. 2006; Rode et al. 2010, 2014, in press; Bromaghin et al. 2015). Declining sea ice conditions in the Beaufort Sea have also led to an increase in the proportion of the subpopulation coming onshore in summer and autumn (from 5.8% during 1986-1999 to 20% during 2000-2014) and a 30 day increase in time spent on land (Atwood et al. 2016). While on land, polar bears typically do not feed (Rode et al.

2015), although bears in the SBS subpopulation are drawn to bowhead whale remains from subsistence harvest, particularly adjacent to the community of Kaktovik, Alaska (Wilson et al. 2017). These whale remains may be helping offset lost hunting opportunities for bears in the SBS subpopulation due to sea ice loss (Herreman and Peacock 2013, Atwood et al. 2016).

In addition to a higher proportion of the SBS subpopulation occurring on shore during summer and autumn, there is also an increasing trend towards more bears denning on land (Olson et al. 2017). Denning substrate (i.e., sea ice or mainland) is significantly related to where bears occur in autumn. Pregnant polar bears in the SBS subpopulation that spent >25 days on land in autumn all subsequently denned on land (Olson et al. 2017). Between 1985-2013, the percent of bears denning on land in the SBS subpopulation increased from 34 to 55%, linked to sea ice declines. Designated Critical Denning Habitat overlaps with 77% of the 1002 area of the Arctic National Wildlife Refuge (U.S. Fish and Wildlife Service 2010). There is also 38% more denning habitat available in the coastal plain of the Arctic National Wildlife than in the region immediately west of the refuge (Durner et al. 2006). Polar bears have been shown to den in the 1002 area with greater frequency than expected based on available habitat (Amstrup 1993). Based on known den locations from 2000-2010, 22% of dens for bears in the SBS subpopulation occurred within the 1002 area (Durner et al. 2010). Thus, the 1002 area has been documented to be an important area for denning by polar bears and will likely increase in importance as the percent of bears denning on land increases with sea ice loss (Olson et al. 2017).

The mean dates of den entrance and emergence for polar bears that den on land in the SBS subpopulation is 11 November and 3 March, respectively (Rode et al. in review). Females observed with cubs in spring emerged 15 days later than females observed without cubs (Rode et al. in review). Land-based denning also appears to be important for polar bears, as bears that den on land have significantly higher reproductive success (Rode et al. in review).

3.2.9 Bowhead Whale

Steller's sea lions

3.3 Social Environment

While several communities lie adjacent to the Refuge, there are no inhabitants living within the Refuge boundaries. Residents of the adjacent communities generally rely on Refuge resources for subsistence.

3.3.1 Cultural Resources

The Arctic Refuge CCP (2012) describes in detail the known cultural and historic context of the Refuge. When considering development within the Refuge's coastal plain, it is important to note that cultural resources on the North Slope and coastal plain are on or near the surface of the tundra and tend to be oriented along river corridors and coastal beaches. This means that many cultural resource sites on the Refuge are vulnerable to erosion and other natural forces, and to a lesser extent, from public use of Refuge lands and waters. Human use has occurred in the area for more than 10,000 years (Reanier 2003).

3.3.2 Historic Background

Communities surrounding the Arctic coastal plain or that rely on resources, such as caribou, from the coastal plain include Arctic Village, Chalkyitsik, Coldfoot, Deadhorse, Fort Yukon, Kaktovik, Prudhoe Bay,Venetie, and Wiseman. Details of the histories of all communities, except Deadhorse and Prudhoe Bay, are included in the Arctic Refuge CCP (2012). Deadhorse and Prudhoe Bay were not included in the CCP because their residents do not generally use Refuge wildlife resources. These communities are fundamentally support infrastructure for the operational oil fields.

Map 3- , shows the location of these communities in and around the Refuge. ***Map Needed***

Prudhoe Bay and Deadhorse
Prudhoe Bay was named in 1828 for Baron Prudhoe by British explorer Sir John Franklin. In the 1970s the site was extensively developed to support oil drilling operations. The 800-mile Trans Alaska Pipeline, constructed to transport crude oil from Prudhoe Bay to Valdez, has it's northern terminus here. At Valdez oil is loaded into marine tankers for shipment throughout the U.S. Prudhoe Bay is also the unofficial northern terminus of the Pan-American Highway. Deadhorse is a small community which is absorbed into Prudhoe Bay for statistical purposes.

Culture
Prudhoe Bay is a large work camp for the oil industry. All residents are employees of oil-drilling or oil-production and support companies and work long consecutive shifts. Living quarters and food are provided to the workforce, and there are a number of recreational facilities. There are no permanent residents of Prudhoe Bay.

3.3.2 Socioeconomic

Although the communities of Arctic Village, Chalkyitsik, Coldfoot, Fort Yukon, Kaktovik, Venetie, Wiseman, and Prudhoe Bay surround the Refuge, generally only economies of Kaktovik, Coldfoot, Wiseman, and Prudhoe Bay would be directly affected by oil and gas exploration as they are located either in locations where infrastructure could be staged or along the Haul Road, the only developed land route into the area. All of the communities would be indirectly affected if caribou, a valuable subsistence resource, was affected due to their proximity to and use of the Porcupine caribou herd.

Chapter 4, section *?* will estimate the economic impacts on these communities.

Table 3 - 2: Demographic Characteristics of the Communities Near Arctic Refuge

Demographic Characteristics	**Arctic Village**	**Chalkyitsik**	**Cold-foot**	**Fort Yukon**	**Kaktovik**	**Venetie**	**Wiseman**	**Prudhoe Bay**
Overall 2010 Census Population	152	69	10	583	239	166	14	2174
American Indian and Alaska Native	135	59	1	45	212	152	0	163
White	7	10	9	520	24	3	13	1804
Two or more races	10	0	0	10	3	10	1	41
Other races	0	0	0	8	0	1	0	166
Median age	29	27.5	43	33.7	30.5	30.5	28.5	50
Median household income	$27,250 +/- $9,667	$38,750 +/- $16,617	Not Available	$33,194 +/- $7,432	$58,125 +/- $33,478	$28,333 +/- $21,379	Not Available	94,906 +/- 11,207
Employment in 2016								
Employed (#)	87	48	11	266	125	103	5	1978
Employed in the Private Sector (#)	14	6	9	113	41	23	5	1978

Employed in local and/or state government (#)	73	42	2	153	84	80	0	0
Employed in all 4 Quarters (#)	31	27	9	138	93	40	0	1891

3.3.3 Environmental Justice
Some of the communities potentially affected by the Proposed Action are predominantly Alaska Native, with lower incomes than Alaska and U.S. averages. As a result of these socioeconomic characteristics, the analysis of environmental consequences of the Proposed Action and Alternatives in Chapter 4 will determine whether there are disproportionate adverse impacts on these communities as a result of the proposed project.

3.3.4 Subsistence
Section 803 of ANILCA defines subsistence uses as: The customary and traditional uses by rural Alaska residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of inedible byproducts of fish and wildlife resources taken for personal or family consumption; for barter or sharing for personal or family consumption; and for customary trade (16 U.S.C. § 3113).

One of the purposes of the Arctic Refuge is to provide the opportunity for continued subsistence uses by local residents in a manner consistent with the purposes of conserving fish and wildlife populations and habitats and fulfilling international treaty obligations with respect to fish and wildlife (USFWS 2015). With the exception of Prudhoe Bay, each of the affected communities within the proposed project area is characterized by active participation in subsistence fishing, hunting, and trapping on federal, state, and Native corporation lands.

Subsistence Harvest Practices In or Near the Refuge
According to the Arctic Refuge CCP (2012) Arctic Village, Chalkyitsik, Fort Yukon, Kaktovik, Venetie, and Wiseman use the Refuge for subsistence purposes. Due to their close proximity Arctic Village, a Gwich'in community, and Kaktovik, a Inupiat community, use the Refuge most frequently. The subsistence way of life encompasses much more than just a way of obtaining food or natural materials. It involves traditions that are important mechanisms for maintaining cultural values, family traditions, kinships, and passing on those values to younger generations. It is considered a way of life, rather than just an activity. (Alaska Federation of Natives 2010).

Not only are subsistence opportunities critical to the cultural identities of these communities, the resources gained provide needed sustenance for residents. There are very few year-round employment opportunities and food costs are high due to the cost of air transportation.

Although both Arctic Village and Kaktovik rely heavily on the Refuge for subsistence resources, the resources used are significantly different. Subsistence harvest in Arctic Village was 10,000 to 21,000 pounds with moose and caribou constituting 90 percent of the harvest in each year, according to the State of Alaska's Community Subsistence Information System (1993-1997) and data collected by the Council of Athabascan Tribal Governments in 2001 and 2002. The harvested caribou from these surveys come primarily from the migrating Porcupine caribou herd. Because of this, the Gwich'in people consider the Porcupine caribou herd's calving grounds on the coastal plain as sacred ground, a birthing place for thousands of caribou each year (Gwich'in National 1988).

In contrast, Kaktovik is an Inupiat community located on Barter Island on the shore of the Beaufort Sea. The Kaktovikmiut's way of life continues to be heavily dependent on subsistence harvest of marine and terrestrial animals and fish. Caribou hunting occurs throughout most of the year, while bowhead whaling occurs from late August to early October. When the community harvests a whale, marine resources composed 59 to 68 percent of their total subsistence harvest (Minerals Management Service 2003). In addition to whales, Kaktovik residents also harvest a considerable number of Dall's sheep and caribou, contributing 17 to 30 percent of the annual harvest by weight.

3.3.5 Land Use

There are currently no permanent developments in the coastal plain. The area is used by recreationists for fishing, other wildlife viewing, hunting, hiking, bird-watching, and photography. The coastal plain is currently managed as a minimal management area. Minimal management is designed to maintain Refuge environments with minimal or no evidence of human modifications or changes. Public uses, economic activities or uses, and facilities are managed to minimize disturbances to habitats and resources. Ground-disturbing activities are avoided whenever possible.

3.3.6 Recreation

The coastal plain is located on lands within ADF&G Game Management Unit (GMU) 26. ADF&G regulates the seasons, licenses, and bag limits (ADF&G 2015h). Access to prime hunting areas is typically by chartered aircraft, boat, or foot. Two guide use areas could be affected by exploration activities. Nonresident brown bear and Dall sheep hunters must be accompanied in the field by a big game guide authorized to operate in the area (USFWS 2014a).

There are two registration brown bear hunting seasons in GMU 26. They are held from January 1 to May 31 and August 25 to May 31. In 2016, of the 27 permits given only 12 people reported going hunting (ADF&G website 2017). Caribou hunting is also popular and the hunt is open year round. No permit statistics were available to quantify caribou hunting pressure.

3.3.7 Noise

Sound is defined as a particular auditory effect produced by a given source, for example the sound of rain on the roof, and is measured in decibels (dB). A-weighted sound level measurements (dBA) are a measure of how the human ear hears sound and is used to

characterize sound levels. Table 3-4 shows dBA levels for sounds associated with the area and equipment being proposed for use in the action alternatives.

Table 3 - 4: dBA Levels

Source of Noise	dBA Level
Ambient sound without human influence	20 – 30 dBA
Ground wind 5-10 miles per hour	35 – 45 dBA
Ground wind 20 – 30 miles per hour	55 – 65 dBA
Single engine plane fly over at 1,000 ft	88 dBA
Cessna 206	79 dBA
Bell Huey 204	88 dBA
R-66	82 dBA
Propane generator at 500 ft away	30-35 dBA
(Bolin 2006, Illingworth and Rodkin 2006, Schulten 1997, ICAO Annex 2006, US Coast Guard 2010)	

Currently there is no source of non-ambient noise on the coastal plain, aside from ground wind and the occasional aircraft, high overhead. Generally, noise levels on the Refuge are expected to be between 20 and 30 dBA in calm winds and up to 40 to 50 dBA in moderate to strong winds.

3.3.8 Visual

Visual resources are often described in relation to landscape character or the overall impression created by an area's unique combination of features, such as land, vegetation, water, and existing structures (cultural modification). Viewsheds are the geographical areas that are visible from given locations. They include all surrounding points that are in line-of-sight with a given location and exclude points that are beyond the horizon or obstructed by terrain and other features.

The landscape character of the coastal plain is of a landscape that is relatively flat, yet interspersed with low ridges and depressions. Tall, linear lined objects would be an unusual characteristic. Viewsheds on the coastal plain are virtually free from indications of human activities.

4 Environmental Consequences

NEPA requires the disclosure of environmental impacts associated with the alternatives including the No Action Alternative. This chapter presents the anticipated environmental impacts of Alternative 1 (No Action) and Alternative 3 (Outer Route). These analyses provide the basis for comparing the effects of the alternatives on the Affected Environment. NEPA requires consideration of context, intensity, and duration of direct impacts, indirect impacts, cumulative impacts, and measures to mitigate for impacts.

The direct, indirect, and cumulative impacts are described for each issue (impact topic) and where applicable, by project phase (construction and operation). The impacts for each issue are based on the intensity (magnitude), duration, and context (extent) of the impact. Summary

impact levels (negligible, minor, moderate, or major) are given for each issue. Definitions are provided below.

4.1 DEFINITIONS OF TERMS

Direct Effects – Direct effects are impacts that are caused by the alternatives at the same time and in the same place as the action.

Indirect Effects – Indirect effects are impacts caused by the alternatives that occur later in time or farther in distance than the action.

Long-term Effects – Long-term effects are impacts that would occur throughout the life of the project.

Short-term Effects- Short-term effects are impacts that would occur during only the construction phase of this project.

Cumulative Effects – The Council on Environmental Quality (CEQ) defines cumulative effects as impacts on the environment which result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor, but collectively significant actions taking place over a period of time (40 CFR 1508.7). Informed decision making is served by consideration of cumulative effects resulting from projects that are proposed, under construction, recently completed, or anticipated to be implemented in the reasonably foreseeable future.

CEQ guidance in considering cumulative effects states that the first steps in assessing cumulative effects involve defining the scope of the other actions and their interrelationship with a proposed action. The scope must consider other projects whose effects coincide with the location and timetable of a proposed action and other actions. Cumulative effects analyses must also evaluate the nature of interactions among these actions (CEQ 1997). The cumulative effects assessment is based on available information at the time of development of this EA.

To identify cumulative effects, the analysis needs to address two fundamental questions.

1. Does a relationship exist such that affected resource areas of the Proposed Action or alternatives might interact with the affected resource areas of past, present, or reasonably foreseeable future actions?
2. If such a relationship exists, then does an EA reveal any potentially significant effects not identified when the Proposed Action is considered alone?

Mitigation - Mitigation includes special procedures and minimization measures that are implemented to avoid, reduce, or compensate for effects caused by an action. Some mitigation measures are already incorporated into the Proposed Action to avoid and reduce the potential for adverse effects. Other mitigation measures could be characterized as Best Management Practices that further reduce or compensate for adverse effects.

4.2 SIGNIFICANCE CRITERIA

Summaries of the effects on the resources synthesize information about context, intensity, and duration, which are weighed against each other to produce a final assessment. While each summary reflects a determination using best professional judgment regarding the relative importance of the various factors involved, Table 4-1 provides a general guide for how summaries are reached.

Table 4 - 1: Descriptions of Final Assessment Categories

Assessment	Description
Beneficial	Resource improvements would occur and would have a perceptible change to the resource.
Adverse: Negligible	Impacts are generally extremely low in intensity (often they cannot be measured or observed), are temporary, and do not affect unique resources.
Adverse: Minor	Impacts tend to be low intensity or of short duration, although common resources may have more intense, longer-term impacts.
Adverse: Moderate	Impacts can be of any intensity or duration, although common resources are affected by higher intensity, longer impacts while unique resources are affected by medium or low intensity, shorter-duration impacts.
Adverse: Significant	Impacts that in their context and due to their intensity (severity) have the potential to meet the thresholds for significance set forth in CEQ regulations and therefore, warrant heightened attention and examination for potential mitigation in order to fulfill the policies set forth in NEPA.

4.3 PAST, PRESENT, OR REASONABLY FORESEEABLE ACTIONS

The following projects have the potential to result in cumulative effects.

<u>Sea ice loss</u>

4.4 ALTERNATIVE 1 – NO ACTION

Direct and Indirect Effects: Implementation of the No Action Alternative would result in no direct or indirect impacts to any of the considered resources. There would be no new exploration activities allowed on the coastal plain; and therefore no effects due to this project would occur.

Cumulative Effects: No direct or indirect effects to the existing condition of the resources considered would occur under the No Action Alternative; therefore, no cumulative effects would occur on the resources.

4.5 ALTERNATIVE 2 - AFFECTED RESOURCES – PHYSICAL ENVIRONMENT

4.5.1 Physical Environment – Soils

Minimization of

Direct and Indirect Effects: Negligible,

Cumulative Effects: Negligible,

Mitigation: Mitigation

4.5.2 Physical Environment – Hydrology

The level of

Direct and Indirect Effects: Negligible

Cumulative: Each

Mitigation: Fuel storage, cleanup,

4.6 ALTERNATIVE 2 - AFFECTED RESOURCES – BIOLOGICAL ENVIRONMENT

4.6.1 Biological Environment – Vegetation

The level of impact on vegetation is based on (1) the importance (i.e., legal, commercial, recreational, ecological, or scientific) of the resource, (2) the proportion of the resource that would be affected relative to its occurrence in the region, (3) the sensitivity of the resource to the proposed activities, and (4) the duration of ecological ramifications. A habitat perspective is used to provide a framework for analysis of general classes of impacts. Impacts to vegetation could include removal of vegetation; loss of available habitat; the introduction of new nonnative, invasive species; or dispersal of existing nonnative, invasive species; or adverse impacts from pollutants that are released from construction operations.

Direct and Indirect Effects: Negligible to

Cumulative Effects: Negligible to

Mitigation: Mitigation of

4.6.2 Biological Environment –Wetlands

The level of impacts on wildlife is based on (1) the importance (i.e., legal, commercial, recreational, ecological, or scientific) of the resource, (2) the proportion of the resource that would be affected relative to its occurrence in the region, (3) the sensitivity of the resource to the proposed activities, and (4) the duration of ecological ramifications. A habitat perspective is used to provide a framework for analysis of general classes of impacts (i.e., removal of available habitat, noise, human disturbance).

Ground disturbance and noise might directly or indirectly cause potential impacts on wildlife resources. Direct impacts from ground disturbance are evaluated by identifying the types and locations of potential ground-disturbing activities in correlation to important biological resources. Mortality of individuals, habitat removal, and damage or degradation of habitats might be impacts associated with ground-disturbing activities.

Noise associated with a proposed action might be of sufficient magnitude to result in the direct loss of individuals and reduce reproductive output within certain ecological settings. Noise may also result in animals moving to less suitable habitat to escape from disturbance and noise. Ultimately, extreme cases of such stresses could lead to population declines or local or regional extinction. To evaluate impacts, considerations were given to the number of individuals or critical species involved, amount of habitat affected, relationship of the area of effect to total available habitat within the region, type of stressors involved, and magnitude of the impacts.

4.6.3 Biological Environment - Fisheries

Direct impacts would include mortality to fish or alterations to habitat by geophysical exploration that make these unacceptable or suboptimal for life history requirements and/or long-term survival, including contaminant spills, failure of sewage or waste-water disposal, blasting, channelization, culverts or barriers to movement, increased turbidity from construction, toxic effects of drilling muds or depletion of dissolved oxygen levels. Overharvesting of selected fish species may occur if not stipulated as a prohibition to the increased human workforce during exploration or development.

Indirect impacts would fish swept into storage reservoirs during high flows (storm events, spring snowmelt or construction activities) where fish are trapped when water levels return to normal or are pumped out. Such events occur naturally. Additionally, such artificial impoundments may provide alternative overwintering habitat for some species in a region where such habitats are scarce. Access to and from the larger population would be necessary for this to be an effective benefit to fish species. Abandoned deep-water reservoirs have been beneficial for several fish species (Moulton and George 2000).

Early pipeline and development in the Prudhoe Bay area reduced some fish populations due to locations of road crossings, undersized or undercut culverts prior to understanding species-specific swimming needs (Moulton and George 2000).

Those species that do not migrate are not as likely to be affected by impacts related to barriers and some habitat changes. However, wintering areas are essential. Therefore, any factor linked with exploration or development that reduces adequate open water depths during winter months may have the potential to reduce populations at specific locations.

Each Arctic grayling river-population is distinct from others. Therefore, geophysical impacts could have a larger footprint on a landscape scale than a single site. However, the distribution of the Arctic grayling has increased in Prudhoe Bay environs since the development of the the oil-field (NRC 2003).

Direct, indirect, and cumulative effects of geophysical exploration and oil-field development pose little risks to freshwater fisheries and their habitats based on recent evaluations and using best management practices that have evolved since the late 1970s to late 1980s (Moulton and George 2000; NRC 2003; BLM 2012). The use of vibration equipment in lieu of blasting has reduced overpressure mortalities in fish and less intrusive to habitats. Low ground-bearing pressure vehicles reduce soil disturbances and potential for sediment mobilization and associated accumulation to lakes and streams. Capping the amount of water withdrawal from any natural waters may minimize overwinter mortalities or reduction of overwintering habitat for fish.

Climate change

Invasive species

4.6.3 Biological Environment - Terrestrial Mammals (Caribou, Muskox, Wolverine, Grizzly Bears)

Impacts to habitat used by terrestrial mammals would be minor, as most seismic activities would occur during the winter on frozen tundra or ice. Potential causes of disturbance to terrestrial mammals from seismic activities would include surface vehicular traffic on frozen tundra or ice and fixed-wing aircraft traffic. In most cases, these activities would cause short-term displacements of and/or disturbance to terrestrial mammals. Where 3-D seismic exploration survey lines are located only 660 to 1,200 feet apart, localized displacement of terrestrial mammals could last for several days or lead to complete abandonment of localized habitat.

Effects on caribou and moose could include temporary habitat displacement and increased energy expenditure associated with increased disturbance movement. Caribou overwintering on the coastal plain would likely be encountered during seismic surveys. It is possible that displacement of caribou by seismic exploration activities during winter could have a negative effect on their energy balance (intake versus expenditure). Because these animals are mobile and the operation would be short in duration (e.g., 2 to 3 days in one area), it is not anticipated that any lasting adverse impacts to caribou would result under most circumstances. However, this assumption has not been scientifically tested and conditions for winter survival vary from year to year. It is possible that this disturbance could have an additive effect on natural winter mortality and could disproportionately impact young of the year and pregnant cows. Caribou have been shown to exhibit panic or violent, running reactions to aircraft flying at elevations of

approximately 160 feet and to exhibit strong escape responses (animals trotting or running) to aircraft flying at 150 to 1,000 feet (Calef et al. 1976).

Previous studies of the effects of oil and gas exploration on muskoxen in Alaska and Canada focused on disturbances associated with winter seismic operations. Some muskoxen reacted to seismic activities at distances up to 2.5 miles from the operations; however, reactions were highly variable among individuals (Reynolds and LaPlant 1985). Responses varied from no change in behavior to becoming alert, forming defense formations, or running away (Winters and Shideler 1990). The movements of muskoxen away from the seismic operations did not exceed 3 miles and had no apparent effect on muskox distribution (Reynolds and LaPlant 1986). Unlike caribou, muskoxen are not able to travel and dig through snow easily. In the winter, they search out sites with shallow snow, and greatly reduce movements and activity to conserve energy (USDOI U.S. Fish and Wildlife Service 1999). Muskoxen survive the winter by using stored body fat and reducing movement to compensate for low forage intake (Dau 2001). Because of this strategy, muskoxen may be even more susceptible to disturbances during the winter. It is possible that repeated disturbances of the same animals during winter could result in increased energetic costs that could increase mortality rates. Depending upon the location of the seismic exploration, impacts on muskox populations would be non-existent to minor.

Seismic camps could result in localized disturbance and/or displacement of terrestrial mammals for up to a few days. Bears and foxes could also be attracted to camps, and in rare instances, conflict could result. Since seismic camps generally move at least once a week and proper handling of wastes would be regulated by lease stipulations, the potential for bears or foxes to be attracted to human food sources would be minor. In addition, most seismic activity would occur when bears were hibernating and not attracted to scents.

The potential effects of seismic activities on wolverines would include disturbance from air and surface vehicle traffic, and increased human presence. Wolverines are considered a shy and secretive species that is present at very low densities and may be sensitive to disturbance.

Direct and Indirect Impacts: Minor, d

Cumulative Impacts: Minor,

Mitigation: Construction and

4.6.4 Biological Environment - Polar Bears

Terrestrial oil and gas industry seismic survey activities on the North Slope of Alaska typically require between 80 and 160 personnel. Substantial logistical support is required for a seismic survey operation, and also to support the personnel camps, vehicles, security, aircraft operations, restocking of the explosive magazine (if explosives are used), medical support, scientists, marine mammal observers, ice road construction, barge traffic, and many other logistical and support functions.

Polar bears present in the Arctic National Wildlife Refuge 1002 area may be affected by seismic survey activities in various ways. Noise, vibrations, sights, and smells produced by seismic survey activities may elicit a wide range of responses from polar bears. Polar bears respond to the sights and sound of snowmachines, vehicles, vessels, and aircraft; especially helicopters (Watts and Ratson 1989; Dyck 2001; Dyck and Baydack 2004; Andersen and Aars 2005). Polar bear responses to disturbance are highly variable and are influenced by an individual bear's previous experiences and tolerance level. Polar bears are most likely to respond to the majority of seismic survey activities with short-term behavioral and physiological responses such as avoidance, increased vigilance, increased heart rate, and other stress responses. Disturbance during resting may result in increased energy expenditure or adverse physiological responses (Watts et al. 1991), but short-term reactions like these will rarely affect the health or survival of individual animals or the population. The effects of fleeing from aircraft may be minimal if the event is short and the animal is otherwise healthy and unstressed. However, on a warmer day, a short run may be enough to overheat a well-insulated polar bear. The effect of fleeing an aircraft or ground vehicle on polar bear cubs, particularly cubs of the year, would likely be the use of energy that otherwise would be needed for survival during a critical time in a polar bear's life, and potentially separation from the female. If the exposure and separation, or both, were brief and singular then the effect would most likely be minimal. Chronic disturbances, extreme reactions, disruption of key behaviors such as feeding or denning, or separation of dependent cubs from the female are more likely to affect health or survival. Polar bears directly interacting with seismic survey activities increase the risk of human-bear encounters, conflicts, and injury or death of polar bears.

Seismic survey activities disturbing female polar bears at maternal den sites are of great concern. Minimizing disturbance while bears are in dens is important because timing of den emergence is significantly related to cub survival (Rode et al. in review). Female polar bears entering dens and females in dens with cubs are more sensitive to noises than other age and sex groups. Disturbance during the early stages of denning may cause a female polar bear to abandon the den site in search of another one. A female polar bear may locate another suitable den site and continue her reproductive process Denning female bears may abandon their dens early in response to stress (Amstrup 1993). Amstrup (1993) reported most polar bears in dens continue to occupy the dens after close approaches by aircraft. Although the snow attenuates some aircraft noise (Blix and Lentfer 1992), repeated overflights may cause polar bears to abandon or depart their dens. Premature den site abandonment after the birth of cubs, or if the female abandons the cubs after they emerge from the den, will result in cub mortality. The potential for disturbance increases once the female emerges from the den. She is more vigilant against perceived threats and easier to disturb.

Though human activities (e.g. industrial, subsistence) are expected to exert a smaller influence on polar bear populations than the loss of sea ice habitat (Atwood et al. 2015; Regehr et al. 2015), the cumulative effects of seismic survey activity and climate change are not well understood. Habitat loss due to changes in Arctic sea ice is the primary cause of decline in polar bear populations, and the decline of sea ice is expected to continue throughout the polar bear's range for the foreseeable future (73 FR 28212, May 15 2008). Under both stabilized and

unabated greenhouse gas emissions models, polar bears are expected to have greatly decreased persistence throughout the region (Atwood et al. 2015). The effects of seismic survey activity in the Arctic National Wildlife Refuge 1002 area combined with the effects of climate change could have unknown effects on the Southern Beaufort Sea population of polar bears.

The requirements of incidental take authorizations under the Marine Mammal Protection Act, such as polar bear interaction plans, training, monitoring, and mitigation measures have proven effective at reducing the effects of oil and gas industry activities, including seismic surveys, on polar bears in other areas of northern Alaska. Mitigation measures, including a pre-activity den survey and a 1.6-km (1-mi) operational exclusion zone around known dens help to limit disturbance of denning female polar bears. The current incidental take regulations for oil and gas industry activity in the Beaufort Sea and adjacent areas of northern Alaska, published in the Federal Register on August 5, 2016 (81 FR 52276), include a comprehensive analysis of the effects of oil and gas industry activity to polar bears, as well as mitigation, monitoring, and reporting requirements. A detailed description of mitigation measures that limit the effects of seismic surveys on polar bears is available at title 50 of the Code of Federal Regulations, part 18, subpart J, section 18.128.

4.6.3 Biological Environment - Bowhead Whale

Direct and Indirect Effects: Minor, near the construction sites in order to not attract brown bears to the locations.

Cumulative Effects: Minor,

Mitigation: Mitigation of

4.6.4 Marine Mammals (Placeholder heading)

Direct and Indirect Impacts: Minor,

Cumulative Impacts: Negligible to

Mitigation: Barge traffic

4.7 Alternative 3 - Affected Resources – Social Environment

4.7.1 Social Environment – Cultural Resources

Mitigation: In accordance with Archaeological Resources Protection Act (16 U.S.C. 470aa), the disturbance of archaeological or historical sites and the removal of artifacts from Federal land is

prohibited. If such sites or artifacts are encountered, the Permittee will immediately cease all work upon Federal land and notify the Refuge Manager.

4.7.2 Social Environment – Socioeconomic

Impacts to socioeconomic resources would be considered to be significant if an action resulted in a substantial change in the local or regional population; and housing, community general services, or social conditions from the demands of additional population/population shifts. Impacts would also be considered major if there were a substantial change in the local or regional economy, employment, or spending or earning patterns.

Direct and Indirect Effects: Minor to

Cumulative Effects: Minor ,

Mitigation: Impacts to s

4.7.3 Social Environment – Environmental Justice

Impacts associated

Direct and Indirect Impacts: Long-term,
Cumulative Effects: Moderate,

Mitigation: No mitigation would be necessary. Impacts associated with Environmental Justice would be expected to be beneficial.

4.7.4 Social Environment – Subsistence

The Alaska National Interest Lands Conservation Act (ANILCA) Section 810 requires an evaluation of the effects on subsistence uses for any action to withdraw, reserve, lease, or otherwise permit the use, occupancy, or disposition of public lands. A comprehensive ANILCA Section 810 analysis is included in Appendix G.

Direct and Indirect Effects: No impacts to

Cumulative Effects: No cumulative eff

Mitigation: Although

4.7.5 Social Environment – Land Use

Factors considered when determining whether an alternative would have a significant impact on land use were evaluated and distinguished by the degree to which the impact would result in:

- Displacement of or adverse effects to relatively large blocks of existing land uses; and

- Development that is inconsistent with adopted laws, regulations, or the long-term goals of approved land use plans or policies.

Direct and Indirect Effects: Land and mineral ownership would not change under this alternative, though this route would not be consistent with the Refuge's Comprehensive Conservation Plan (CCP) guidance because the stations would be constructed within a Minimal Management area. Under the CCP, lands within the Minimal Management category are to maintain the natural environment with very little evidence of human-caused change, and ground-disturbing activities are to be avoided whenever possible. With the exception of cabins, no permanent structures are generally allowed. In order to allow the proposed facilities on the Refuge, the Kodiak CCP would need to be amended to change the management category from Minimal Management to Moderate Management for areas in the immediate vicinity of the repeater stations. The change to Moderate Management would allow impacts to the naturalness of the areas and distinct evidence of human-caused change. These impacts would be evident not only within the footprint of the Moderate Management, but also within the 10 mile viewshed of the proposed project (Figures 3-7 to 3-13). Habitats could be disturbed and their ability to function through natural processes might be impaired.

Specifically, direct, minor adverse effects would include: 1) long-term removal of 0.33 acres of land from public access within the Refuge for each repeater station site for the life of the project and 2) significant helicopter traffic during the construction season, which though of short duration, would be of high intensity and during the height of fishing and tourism season.

Indirect adverse effects would include the need for a significant number of helicopter flights each time the stations are refueled, estimated to be every 18 months. Refueling would require approximately 20 round trips for each station in a single day. Although there are already multiple flights in the area on any given day, this level of helicopter use would be noticeable and would diminish the feeling of naturalness and remoteness for any refuge visitor using the area within the flight path for any purpose on that day. Additionally, each repeater station would require two maintenance visits each year. Each of these would require only a single round trip helicopter flight and would have negligible adverse effects given the number of other aircraft activities in the area.

Cumulative Effects: Implementation of the proposed alternative would increase the total effect on regional land use (due to additional helicopter use) and acreage disturbed in association with communication systems within the Kodiak Refuge. The unrelated project of removing existing radio repeaters that are no longer in use would contribute a small decrease in cumulative effects.

Mitigation: As a mitigation measure, helicopter-supported refueling would be scheduled to occur from December 1 to February 28 or August 1 to October 24 to avoid the most intensive hunting, fishing, and recreational activity periods.

4.7.6 Social Environment – Recreation

Direct and Indirect Impacts: Moderate,

Cumulative Impacts: The existing

Mitigation: As a

4.7.7 Social Environment – Noise/Soundscape

Direct and Indirect Effects: Direct adve

Cumulative Effects: Moderate,

Mitigation: When

4.7.8 Social Environment – Visual

The impact analysis was

Direct and Indirect Effects: Construction of th

Cumulative Effects: This prop

Mitigation: The towers a

5 Irreversible and Irretrievable Commitment of Resources

Irreversible or irretrievable commitments of resources would be made in construction materials used to build the facility and during operation through the use of propane for generating electricity. No other irreversible or irretrievable commitments have been identified as a result of the analysis of potential environmental impacts.

6 List of Preparers, Contributors, and Advisors

This EA was developed by U.S. Fish and Wildlife Service (Service) staff. The Service holds final responsibility for all content. Personnel for each contributing party are listed in Table 6-1.

Table 6 - 1: Preparers, Contributors, and Advisors

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7 References

Alaska Department of Fish and Game [ADFG]. 2017a. Central Arctic Caribou Herd News, Winter 2016-17. http://www.adfg.alaska.gov/static/home/library/pdfs/wildlife/central_arctic_herd/central_arctic_caribou_herd_news_winter_2016_2017.pdf

Alaska Department of Fish and Game [ADFG]. 2017b. Porcupine Caribou Herd News, Summer 2017. http://www.adfg.alaska.gov/static/home/library/pdfs/wildlife/porcupine_caribou_news/porcupine_caribou_news_summer_2017.pdf

Amstrup, S.C. 1993. Human disturbances of denning polar bears in Alaska. Arctic 46: 246-250.

Amstrup, S.C., I. Stirling, and J.W. Lentfer. 1986. Past and present status of polar bears in Alaska. Wildlife Society Bulletin 14:241-254.

Andersen, M., Aars, J. 2005. Behavioural response of polar nears to disturbance by snowmobiles. Brief Report Series, Norsk Polarinstitutt, Tromso, Norway. Available: http://link.springer.com/article/10.1007/s00300-007- 0376-x#page- 2.

Atwood, T.C., B.G. Marcot, D.C. Douglas, S.C. Amstrup, K.D. Rode, G.M. Durner, J.F. Bromaghin. 2015. Evaluating and ranking threats to the long-term persistence of polar bears. USGS Open-File Report 2014-1254, 114 p. doi:10.3133/ofr20141254.

Atwood, T.C., E. Peacock, M.A. McKinney, K. Lillie, R.R. Wilson, D.C. Douglas, S. Miller, and P. Terletzky. 2016. Rapid environmental change drives increased land use by an Arctic marine predator. PLoS One 11:e0155932.

Blix, A.S. J.W. Lentfer. 1992. Noise and vibration levels in artificial polar bear dens as related to selected petroleum exploration and developmental activities. Arctic 45: 20–24.

Bromaghin, J.F., T.L. McDonald, I. Stirling, A.E. Derocher, E.S. Richardson, E.V. Regehr, D.C. Douglas, G.M. Durner, T.C. Atwood, and S.C. Amstrup. 2015. Polar bear population dynamics in the southern Beaufort Sea during a period of sea ice decline. Ecological Applications 25:634-651.

Calef, G., E. DeBock, and G. Lortie. 1976. The Reaction of Barren-Ground Caribou to Aircraft. Arctic 29:201-212.

Caikoski, J.R.. 2011. Units 25A, 25B, 25D and 26C caribou [Porcupine Herd]. Pages 251-270 *in* Harper, editor. Caribou management report of survey and inventory activities, 1 July 2008- 30 June 2010. Alaska Department of Fish and Game, Project 3.0 Juneau, Alaska, USA.

Cameron, R.D. and K.R. Whitten. 1979. Seasonal movements and sexual segregation of caribou determined by aerial survey. The Journal of Wildlife Management. 43:626-33.

Cameron, R.D., W.T. Smith, R.G. White and B. Griffith. 2002. The Central Arctic Caribou Herd. Pages 38-45 *in* D.C. Douglas et al., editors. Arctic Refuge coastal plain terrestrial wildlife research summaries. U.S. Geological Survey, Biological Resources Division, Biological Science Report USGS/BRD/BSR-2002-0001, Reston, Virginia, USA.

Dau, J. 2001. Muskox Survey-Inventory Management Report, Unit 23. In Muskox. Federal Aid in Wildlife Restoration - Inventory Management Report, Grants W-24-5 and W27-1, Study 16.0, M.V. Hicks (ed.). Alaska Department of Fish and Game, Juneau, Alaska.

DOI:10.1111/gcb.13933 United States Fish and Wildlife Service. 2010. Designation of critical habitat for the polar bear (*Ursus maritimus*) in the United States. Federal Register 75:76086-76137.

Durner, G.M., S.C. Amstrup and K. Ambrosius. 2006. Polar bear maternal den habitat on the Arctic National Wildlife Refuge, Alaska. Arctic 59:31-36.

Durner, G.M., A.S. Fischbach, S.C. Amstrup, and D.C. Douglas. 2010. Catalogue of Polar Bear (*Ursus maritimus*) Maternal Den Locations in the Beaufort Sea and Neighboring Regions, Alaska, 1910-2010. USGS Data Series 568.

Dyck, M.G., 2001. Effects of tundra vehicle activity on polar bears (Ursus maritimus) at Churchill, Manitoba. MNRM thesis, University of Manitoba, Winnipeg.

Dyck, M.G., R.K. Baydack. 2004. Vigilance behaviour of polar bears (Ursus maritimus) in the context of wildlife-viewing activities at Churchill, Manitoba, Canada. Biological Conservation 116(3):343-350.

Herreman, J. and E. Peacock. 2013. Polar bear use of a persistent food subsidy: Insights from non-invasive genetic sampling in Alaska. Ursus 24:148-163.

Obbard, M.E., G.W. Thiemann, E. Peacock, and T.D. DeBruyn. 2010. Polar Bears: Proceedings of the 15th Working Meeting of the IUCN/SSC Polar Bear Specialist Group, Copenhagen, Denmark, 29 June–3 July 2009. Gland, Switzerland and Cambridge, UK: IUCN.

Olson, J.W., K.D. Rode, D.L. Eggett, T.S. Smith, R.R. Wilson, G.M. Durner, A.S. Fischbach, T.C. Atwood, and D.C. Douglas. 2017. Collar temperature sensor data reveal long-term patterns in southern Beaufort Sea polar bear den distribution on pack ice and land. Marine Ecology Progress Series 564:211-224.

Regehr, E.V., S.C. Amstrup, and I. Stirling. 2006. Polar Bear Population Status in the Southern Beaufort Sea. U. S. Geological Survey, Alaska Science Center, Anchorage. Open-File Report 1337.

Regehr, E.V., R.R. Wilson, K.D. Rode, M.C. Runge. 2015. Resilience and risk - A demographic model to inform conservation planning for polar bears. USGS Open-File Report 2015-1029, 56 p. doi:10.3133/ofr20151029.

Reynolds, P.E. and D.J. LaPlant. 1985. Effects of Winter Seismic Exploration Activities on Muskoxen in the Arctic National Wildlife Refuge. In Arctic National Wildlife Refuge Coastal Plain Resource Assessment. 1984 Update Report Baseline Study of the Fish, Wildlife, and Their Habitats, G.W. Garner and P.E. Reynolds (eds.). ANWR Progress Report No, FY85-2, Volume I. U.S. Department of Interior, U.S. Fish and Wildlife Service, Anchorage, Alaska.

Rode, K.D., J. Olson, D. Eggett, D.C. Douglas, G.M. Durner, T.C. Atwood, E.V. Regehr, R.R. Wilson, T. Smith, and M. St. Martin. In review. Denning phenology and polar bear reproductive success in a changing climate. Journal of Mammalogy.

Rode, K.D., S.C. Amstrup, and E.V. Regehr. 2010. Reduced body size and cub recruitment in polar bears associated with sea ice decline. Ecological Applications. 20:768-782.

Rode, K.D., E.V. Regehr, D.C. Douglas, G.M. Durner, A.E. Derocher, G.W. Thiemann, and S.M. Budge. 2014. Variation in the response of an Arctic top predator experiencing habitat loss: feeding and reproductive ecology of two polar bear populations. Global Change Biology 20:76-88.

Rode, K.D., C.T. Robbins, L. Nelson, and S.C. Amstrup. 2015. Can polar bears use terrestrial foods to offset lost ice-based hunting opportunities?. Frontiers in Ecology and the Environment 13:138-145.

Rode, K.D., R.R. Wilson, D.C. Douglas, V. Muhlenbruch, T.C. Atwood, E.V. Regehr, E. Richardson, N. Pilfold, A. Derocher, G. Durner, I. Stirling, S. Amstrup, M. St. Martin, A. Pagano, E. Peacock, and K. Simac. In press. Spring fasting behavior among polar bears provides and index of ecosystem productivity. Global Change Biology.

U.S. Department of the Interior, Fish & Wildlife Service (USFWS). 1999. Guide to Management of Alaska's Land Mammals. U.S. Department of Interior, U.S. Fish and Wildlife Service, Office of Subsistence Management, Anchorage, Alaska.

Watts, P.D., Ferguson, K.L., Draper, B.A., 1991. Energetic output of subadult polar bears (Ursus maritimus): resting, disturbance and locomotion. Comparative Biochemistry and Physiology A., Comparative Physiology 98:191–193.

Watts, P.D., Ratson, P.S., 1989. Tour operator avoidance of deterrent use and harassment of polar bears. In: Bromley, M. (Ed.), Bear–People Conflicts, Proceedings of a Symposium on Management Strategies. Northwest Territories Department of Renewable Resources, Yellowknife, pp. 189–193.

Winters, J.F. and R.T. Schideler. 1990. An Annotated Bibliography of Selected References of Muskoxen Relevant to the National Petroleum Reserve – Alaska. Alaska Department of Fish and Game, Fairbanks, Alaska.

Wilson, R.R., E.V. Regehr, M. St. Martin, T.C. Atwood, L. Peacock, S. Miller, and G. Divoky. 2017. Onshore ecology of polar bears in relation to sea-ice loss with implications for the management of conflict with humans. Biological Conservation 214:288-294.

Griffith, B., D.C. Douglas, N.E. Walsh, D.D. Young, T.R. McCabe, D.E. Russell, R.G. White, R.D. Cameron and K.R. Whitten. 2002. The Porcupine Caribou Herd. Pages 8-37 *in* D.C. Douglas et al., editors. Arctic Refuge coastal plain terrestrial wildlife research summaries. U.S. Geological Survey, Biological Resources Division, Biological Science Report USGS/BRD/BSR-2002-0001, Reston, Virginia, USA.

Jorgenson, J.C., M.S. Udevitz and N.A. Felix. 2002. Forage quantity and quality. Pages 6-50 *in* D.C. Douglas et al., editors. Arctic Refuge coastal plain terrestrial wildlife research summaries. U.S. Geological Survey, Biological Resources Division, Biological Science Report USGS/BRD/BSR-2002-0001, Reston, Virginia, USA.

Lenart, E.A. 2007. Units 25A, 15B, 15D and 26C caribou [Porcupine Herd]. Pages 232-248 *in* Harper, editor. Caribou management report of survey and inventory activities, 1 July 2004- 30 June 2006. Alaska Department of Fish and Game, Project 3.0 Juneau, Alaska, USA.

Lenart, E.A. 2011. Units 26B and 26C caribou [Central Arctic Herd]. Pages 315-336 *in* Harper, editor. Caribou management report of survey and inventory activities, 1 July 2008- 30 June 2010. Alaska Department of Fish and Game, Project 3.0 Juneau, Alaska, USA.

Bird, K.J., and L.B. Magoon. 1987. Petroleum geology of the northern part of the Arctic National Wildlife Refuge, northeastern Alaska. U.S. Department of the Interior, Geological Survey Bulletin 1778.

BLM (Bureau of Land Management). 2012. National Petroleum Reserve – Alaska, Final Integrated activity plan/Environmental impact statement. Anchorage, AK: U.S. Department of the Interior, Bureau of Land Management.

Brooks, J. 1970. Environmental influences of oil and gas development with reference to the Arctic Slope and Beaufort Sea. Anchorage, AK: U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife.

Clough, N.K., P.C. Patton, and A.C. Christiansen. 1987. Arctic National Wildlife Refuge, Alaska, coastal plain resources assessment: report and recommendation to the Congress of the United States and final legislative environmental impact statement (2 Volumes). Washington, D.C.: U.S. Department of the Interior, Geologic Survey and Bureau of Land Management.

Craig, P.C. 1984. Fish use of the coastal waters of the Beaufort Sea: a review. Transactions of the American Fisheries Society 113:265-282.

DOE (U.S. Department of Energy). 2009. Potential oil production from the coastal plain of the Arctic National Wildlife Refuge: updated assessment. Washington, D.C.: U.S. Department of Energy.

DOI (U.S. Department of the Interior). 1974. Final environmental impact statement: proposed Arctic National Wildlife Refuge, Alaska. Washington, D.C.; U.S. Department of the Interior.

DOI (U.S. Department of the Interior). 1983. Final environmental impact statement and preliminary final regulations: proposed oil and gas exploration within the coastal plain of the Arctic National Wildlife Refuge, Alaska (2 Volumes). Washington, D.C.: U.S. Department of the Interior, Fish and Wildlife Service, Geological Survey, and Bureau of Land Management.

DOI (U.S. Department of the Interior). 1988a. Arctic National Wildlife Refuge comprehensive conservation plan, environmental impact statement, wilderness review, and wild river plans: final. Anchorage, AK: U.S. Department of the Interior, Fish and Wildlife Service, Alaska Region.

DOI (U.S. Department of the Interior). 1988b. Record of decision: Arctic National Wildlife Refuge comprehensive conservation plan, environmental impact statement, wilderness review, and wild river plans. Anchorage, AK: U.S. Department of the Interior, Fish and Wildlife Service, Alaska Region.

Douglas, D.C., P.E. Reynolds, and E.B. Rhodes. 2002. Arctic Refuge coastal plain terrestrial wildlife research summaries. Reston, VA: U.S. Department of the Interior, Geological Survey Biological Science Report USGS/BRD/BSR-2002-0001.

Fredrickson, L.H. 2001. Steller's Eider (*Polysticta stelleri*), v.2.0. in Birds of North America, P.G. Rodewald (ed.). Ithaca, NY: Cornell Lab of Ornithology. https://doi.org/10.2173/bna.571

FWS (U.S. Fish and Wildlife Service). 1982. Arctic National Wildlife Refuge coastal plain resource assessment: initial report baseline study of the fish, wildlife, and their habitats. Anchorage, AK: U.S. Department of the Interior, Fish and Wildlife Service, Alaska Region.

FWS (U.S. Fish and Wildlife Service). 1983. 50 CFR Part 37 - Geological and geophysical exploration of the coastal plain, Arctic National Wildlife Refuge, Alaska: final rule. Federal Register 48(76):16838-16872.

FWS (U.S. Fish and Wildlife Service). 1988a. Arctic National Wildlife Refuge comprehensive conservation plan, environmental impact statement, wilderness review, and wild river plans: final. Anchorage, AK: U.S. Department of the Interior, Fish and Wildlife Service, Alaska Region.

FWS (U.S. Fish and Wildlife Service). 1988b. Record of decision: Arctic National Wildlife Refuge comprehensive conservation plan, environmental impact statement, wilderness review, and wild river plans. Anchorage, AK: U.S. Department of the Interior, Fish and Wildlife Service, Alaska Region.

FWS (U.S. Fish and Wildlife Service). 1990. Management of oil and gas activity on the 1002 area of the Arctic National Wildlife Refuge. Anchorage, AK: U.S. Department of the Interior, Fish and Wildlife Service, Alaska Region.

FWS (U.S. Fish and Wildlife Service). 1994. Water resource inventory and assessment, Arctic National Wildlife Refuge 1987-1992: final report. Anchorage, AK: U.S. Department of the Interior, Fish and Wildlife Service, Water Resources Branch.

FWS (U.S. Fish and Wildlife Service). 2015a. Arctic National Wildlife Refuge revised comprehensive conservation plan, final environmental impact statement, Wilderness review, and Wild and Scenic River review (4 Volumes). Fairbanks, AK: U.S. Department of the Interior, Fish and Wildlife Service, Alaska Region.

FWS (U.S. Fish and Wildlife Service). 2015b. Record of decision: revised comprehensive conservation plan Arctic National Wildlife Refuge. Anchorage, AK: U.S. Department of the Interior, Fish and Wildlife Service, Alaska Region.

Gallaway, B.J. and R.G. Fechhelm. 2000. Anadromous and amphidromous fishes. Pp. 349-369 in in J.C. Truett and S.R. Johnson (eds.), The natural history of an Arctic oil field: development and the biota. San Diego, CA: Academic Press.

GAO (U.S. General Accounting Office). 1993. Trans-Alaskan pipeline: projections of long-term viability are uncertain. Washington, D.C.: U.S. General Accounting Office; Resources, Community, and Economics Development GAO/RCED-93-69.

Garner, G.W., and P.E. Reynolds. 1983. Arctic National Wildlife Refuge coastal plain resource assessment: 1982 update report baseline study of the fish, wildlife, and their habitats. Anchorage, AK: U.S. Department of the Interior, Fish and Wildlife Service, Alaska Region.

Garner, G.W., and P.E. Reynolds. 1984. Arctic National Wildlife Refuge coastal plain resource assessment: 1983 update report baseline study of the fish, wildlife, and their habitats. Anchorage, AK: U.S. Department of the Interior, Fish and Wildlife Service, Alaska Region.

Garner, G.W., and P.E. Reynolds. 1985. Arctic National Wildlife Refuge coastal plain resource assessment: 1984 update report baseline study of the fish, wildlife, and their habitats. Anchorage, AK: U.S. Department of the Interior, Fish and Wildlife Service, Alaska Region.

Garner, G.W., and P.E. Reynolds. 1986. Arctic National Wildlife Refuge coastal plain resource assessment: final report baseline study of the fish, wildlife, and their habitats (3 volumes). Anchorage, AK: U.S. Department of the Interior, Fish and Wildlife Service, Alaska Region.

Garner, G.W., and P.E. Reynolds. 1987. Arctic National Wildlife Refuge coastal plain resource assessment: 1985 update report baseline study of the fish, wildlife, and their habitats (3 volumes). Anchorage, AK: U.S. Department of the Interior, Fish and Wildlife Service, Alaska Region.

Glesne, R.S., and S.J. Deschermeier. 1984. Abundance, distribution and diversity of aquatic macroinvertebrates on the North Slope of the Arctic National Wildlife Refuge, 1982 and 1983. Pp. 523-552 in G.W. Garner and P.E. Reynolds (eds.), Arctic National Wildlife Refuge coastal plain resource assessment: 1984 update report baseline study of the fish, wildlife, and their habitats. Anchorage, AK: U.S. Department of the Interior, Fish and Wildlife Service, Alaska Region.

Hanley, P.A., J.E. Hemming, J.W. Morsell, T.A. Morehouse, L.E. Leask, and G.S. Harrison. 1981. Natural resource protection and petroleum development in Alaska: a summary. U.S. Department of the Interior, Fish and Wildlife Service, Biological Services Program FWS/OBS-80/22.1.

Hanley, P.A., J.E. Hemming, J.W. Morsell, T.A. Morehouse, L.E. Leask, and G.S. Harrison. 1983. A handbook for management of oil and gas activities on lands in Alaska: petroleum industry practices, environmental impacts and stipulations. U.S. Department of the Interior, Fish and Wildlife Service, Biological Services Program FWS/OBS-80/23.

Lyons, S.M., and J.M. Trawicki. 1994. Water resource inventory and assessment, coastal plain, Arctic National Wildlife Refuge: 1987-1992 Final Report. Anchorage, AK: U.S. Department of the Interior, Fish and Wildlife Service, Alaska Region.

Martin, P.D., J.L. Jenkins, F.J. Adams, M.T. Jorgenson, A.C. Matz, D.C. Payer, P.E. Reynolds, A.C. Tidwell, and J.R. Zelenak. 2009. Wildlife response to environmental Arctic change: predicting future habitats of Arctic Alaska. Report of the Wildlife Response to Environmental Arctic Change (WildREACH): Predicting Future Habitats of Arctic Alaska Workshop; 17-18 November 2008. Fairbanks, AK: U.S. Department of the Interior, Fish and Wildlife Service, Alaska Region.

McCabe, T.R., D.B. Griffith, N.E. Walsh, and D.D. Young. 1992. Terrestrial research: 1002 area – Arctic National Wildlife Refuge, interim report 1988-1990. Fairbanks, AK: Alaska Fish and Wildlife Research Center and Arctic National Wildlife Refuge.

Mecklenburg, C.W., T.A. Mecklenburg, and L.K. Thorsteinson. 2002. Fishes of Alaska. Bethesda, MD: American Fisheries Society.

Meehan, R., and P.J. Weber, and D. Walker. 1986. Tundra development review: toward a cumulative impact assessment method (2 volumes). Report prepared for U.S. Environmental Protection Agency, U.S. Department of Energy, and U.S Fish and Wildlife Service. Anchorage, AK: U.S. Department of the Interior, Fish and Wildlife Service, Alaska Investigations AI 87/02.

Moulton, L.L., and J.C. George. 2000. Freshwater fishes in the Arctic oil-field region and coastal plain of Alaska. Pp. 327-348 in J.C. Truett and S.R. Johnson (eds.), The natural history of an Arctic oil field: development and the biota. San Diego, CA: Academic Press.

NRC (National Research Council). 2003. Cumulative environmental effects of oil and gas activities on Alaska's North Slope. Washington, D.C.: National Academies Press.

Petersen, M.R., J.B. Grand and C.P. Dau. 2000. Spectacled Eider (*Somateria fischeri*), v.2.0. in Birds of North America, P.G. Rodewald (ed.). Ithaca, NY: Cornell Lab of Ornithology. https://doi.org/10.2173/bna.547

Pollard, R.H., R. Rodrigues, and R.C. Wilkinson. 1990. Wildlife use of disturbed habitats in Arctic Alaska: 1989 final report. Anchorage, AK: LGL Alaska Research Associates.

Reynolds, J.B. 1997. Ecology of overwintering fishes in Alaskan freshwaters. Pp. 281-302 in A.M. Milner and M.W. Oswood (eds.), Freshwaters of Alaska: ecological synthesis. New York, NY: Springer-Verlag.

Schmidt, D.R., W.B. Griffiths, and L.R. Martin. 1989. Overwintering biology of anadromous fish in the Sagavanirktok River Delta, Alaska. Biological Papers of the University of Alaska 24:55-74.

Truett, J.C. 1990. Effects of habitat disturbance on Arctic wildlife: a review and analysis, final report. Anchorage, AK: LGL Alaska Research Associates.

Truett, J.C., R. Howard, and S.R. Johnson. 1982. The Kuparuk oil field ecosystem – a literature summary and synthesis, and an analysis of impact research. Anchorage, AK: LGL Alaska Research Associates.

Truett, J., and S. Johnson. 2000. The natural history of an Arctic oil field: development and the biota. San Diego, CA: Academic Press.

USGS (U.S. Geological Survey). 2001. Arctic National Wildlife Refuge, 1002 area, petroleum assessment, 1998, including economic analysis. Renton, VA: U.S. Department of the Interior, Geological Survey Fact Sheet 0028-01: online report https://pubs.usgs.gov/fs/fs-0028-01

West, R.L., and D.W. Wiswar. 1985. Fisheries investigations on the Arctic National Wildlife Refuge, Alaska, 1984. Pp. 729-777 in in G.W. Garner and P.E. Reynolds (eds.), Arctic National Wildlife Refuge coastal plain resource assessment: 1984 update report baseline study of the fish, wildlife, and their habitats. Anchorage, AK: U.S. Department of the Interior, Fish and Wildlife Service, Alaska Region.

Curtis, J., W. Wendler, R. Stone, and E. Dutton, 1998: Precipitation decrease in the western Arctic, with special emphasis on Barrow and Barter Island, Alaska, Int. J. Climatol., 18, 1,687–1,707.

L'Heureux, M. L., M. E. Mann, B. I. Cook, B. E. Gleason, and R. S. Vose, 2004: Atmospheric circulation influences on seasonal precipitation patterns in Alaska during the latter 20th century, J. Geophys. Res., 109, D06106, doi:10.1029/2003JD003845.

McAfee, S.A., Guentchev, G. and Eischeid, J.K., 2013: Reconciling precipitation trends in Alaska: 1. Station-based analyses. Journal of Geophysical Research: Atmospheres, 118 (14), pp.7523-7541.

Taylor, P.C., W. Maslowski, J. Perlwitz, and D.J. Wuebbles, 2017: Arctic changes and their effects on Alaska and the rest of the United States. In: Climate Science Special Report: Fourth National Climate Assessment, Volume I[Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 303-332, doi: 10.7930/J00863GK.

Wendler, G., Shulski, M. and Moore, B., 2010:. Changes in the climate of the Alaskan North Slope and the ice concentration of the adjacent Beaufort Sea. Theoretical and Applied Climatology, 99(1-2), pp.67-74.

Wendler, G., B. Moore, and K. Galloway, 2014: Strong temperature increase and shrinking sea ice in Arctic Alaska. The Open Atmospheric Science Journal, 8, 7-15. http://dx.doi.org/10.2174/1874282301408010007

Appendix A. Public Notice

Appendix B. Representative Scoping Letter to Native Tribes and Corporations

Appendix C. ESA Section 7 Intra-Agency Consultation

Appendix D. ESA Section 7 Concurrence from National Marine Fisheries Service

Appendix E. Compatibility Determination

Appendix G. ANILCA Section 810 Subsistence Analysis

Project Description:

Alaska State Hunting & Trapping Seasons & Limits		
Species	**Limit**	**Season**
Black Bear	Three bears	No closed season
Brown/Grizzly Bear - 26A	One bear every regulatory year	General season - no closed season
Brown/Grizzly Bear - 26B Hunt Number RB988 Hunt Number RB989 Hunt Number DB987	Per regulatory year One bear by bow and arrow One bear One bear	 Aug 10 - Dec 31 Jan 1 - May 31 Aug 25-May 31
Brown/Grizzly Bear - 26B Remainder Hunt Number RB988 Hunt Number RB989 Hunt Number DB987	 One bear One bear One bear	 Aug 25 - Dec 31 Jan 1 - May 31 Aug 25-May 31
Brown/Grizzly Bear - Unit 26C	One bear every regulatory year	July 25 - June 30
Caribou - 26A the Colville River drainage upstream from the Anaktuvuk River, and drainages of the Chukchi Sea south and west of, and including the Utukok River drainage	Five caribou per day however no calves may be taken Bulls RC907 Cow RC907 One bull, however calves may not be taken	July 1 - Oct 14 Feb1 - June 30 July 15 - April 30 July 15 - Sept 30
Caribou - 26B northwest portion: north of 69°30’ N. lat. (milepost 362) and west of the east bank of the Kuparuk River to a point at 70°10’ N. lat., 149°04’ W. long., then west approximately 22 miles to 70°10’ N. lat. and 149°56’ W. long., then following the east bank of the Kalubik Creek to the Arctic Ocean	Five caribou per day Bulls Cows One Bull	 no closed season July 1-May 15 Aug 1 - Sept 15
Caribou - 26B Remainder (A portion of this area is within the Dalton Highway Corridor Management Area and additional restrictions apply. See regulation book.)	DHCMA Two bulls DHCMA One bull	Aug 1 - Apr 30 Aug 1 - Sept 15

Caribou - 26C	Ten caribou total Any caribou Bulls Two bulls	 July 1 - April 30 June 23 - June 30 Aug 1 - Sept 30
Moose 26A west of 156° 00' W. long. excluding the Colville River drainage	One moose however, a person may not take a calf of cow accompanied by a calf	July 1 - Sept 14
Moose 26 A the Colville River drainage above and including the Anaktuvuk River drainage	One bull	Aug 1 - Sept 14
Moose 26 A Remainder	One bull	Aug 1 - Sept 14
Moose 26B and 26C		No open season
Muskox		No open season
Sheep 26A west of Etivluk River drainage (DeLong Mtns)		No open season
Sheep 26A east of and including the Etivluk River drainage, excluding Gates of the Arctic National Park	One ram with full-curl horn or larger. Youth hunt only One ram with full-curl horn or larger OR Three sheep by permit RS389 One ram with full-curl horn or larger every four regulatory years	Aug 1 - Aug 5 Aug 10 - Sept 20 Aug 1 - April 30 Aug 10 - Sept 20
Sheep 26A Private lands within the Gates of the Arctic National Park	Three sheep	Aug 1-April 30
Sheep 26A and 26B Remainder	One ram with full-curl horn or larger - youth hunt only One ram with full-curl horn or larger every four regulatory years. Youth hunt only One ram with full-curl horn or larger One ram with full-curl horn or larger every four regulatory years	Aug 1 - Aug 5 Aug 1 - Aug 5 Aug 10 - Sept 20
Dall Sheep General 26C Remainder - Youth hunt	One ram with full-curl horn or larger	Aug 1 - Aug 5

Dall Sheep 26C Hunt number RS595	Three sheep by permit	Oct 1 - April 30
Dall Sheep 26C	One ram with full-curl horn or larger every four regulatory years - youth hunt only	Aug 1 - Aug 5
Dall Sheep General 26C Remainder	One ram with full-curl horn or larger every four regulatory years	Aug 10 - Sept 20
Wolf	10 wolves	Aug 10 - Apr 30
Wolverine - Unit 26A	One wolverine	Sept 1 - Mar 31
Wolverine - Unit 26B&C	One wolverine	Aug 20 - Mar 31
Beaver		No open season
Coyote	No limit	No closed season
Arctic Fox	Two foxes	Sept 1 - Apr 30
Red Fox	10 foxes however no more than 2 foxes may be taken before Oct 1	Sept 1 - Mar 15
Lynx	Two lynx	Nov 1 - Apr 15
Squirrel	No limit	No closed season
Grouse	Fifteen per day, thirty in possession	Aug 10 - Mar 31
Ptarmigan - Except Unit 26B within the DCHMA and Prudhoe Bay Closed Area	Fifty per day, one hundred in possession	Aug 10 - June 15
Hare	No limit	No closed season
Shrew, mouse, and porcupine	No limit	No closed season
Crow		No open season
Snowy Owl - bird may be taken only if used for food or clothing, and no bird or part of a bird may be sold or offered for sale	No limit	Sept 1 - April 1
Feral non-native game birds	No limit	No closed season
Starling, English Sparrow, Racoon, Muridae Rodent, Rockdove, Belgian Hare, and Eurasian Collared Doves	No limit	No closed season
Feral Ferret and Feral Swine	No limit	No Closed season
Federal Subsistence Hunting Seasons & Limits		
Species	**Limit**	**Season**
Black Bear	3 bear	July 1- June 30
Brown Bear 26A 26B	1 bear 26A State subsistence registration permit only	 July 1 - June 30 Jan 1 - Dec 31

26C		Aug 10 - June 30
Caribou - Units 26A and 26C—Residents of Unit 26, Anaktuvuk Pass, and Point Hope	Unit 26A–that portion of the Colville River drainage upstream from the Anaktuvuk River, and drainages of the Chukchi Sea south and west of, and including the Utukok River drainage—5 caribou per day as follows: Calves may not be taken. Bulls may be harvested. Cows may be harvested; however, cows accompanied by calves may not be taken July 16–Oct. 15.	 July 1 - Oct. 14 Dec 6 - June 30 July 16 - Mar. 15
Caribou - Units 26A remainder	5 caribou per day as follows: Calves may not be taken. Bulls may be harvested. Up to 3 cows per day may be harvested; however, cows accompanied by calves may not be taken July 16–Oct. 15	 July 1 - Oct. 15 Dec 6 - June 30 July 16 - Mar. 15
Caribou - Unit 26B Unit 26B, that portion south of 69° 30' N. lat. and west of the Dalton Highway	5 caribou per day as follows: Bulls may be harvested. Cows may be harvested.	July 1 - June 30 Dec 10 - June 30 July 1 - Apr 30
Caribou - Unit 26B remainder	5 caribou per day as follows: Bulls may be harvested. Cows may be harvested.	 July 1 - June 30 July 1 - May 15
Moose - Residents of Unit 26 (except the Prudhoe Bay-Deadhorse Industrial Complex), Anaktuvuk Pass, and Point Hope	Unit 26A - that portion of the Colville River drainage upstream from (and including) the Anaktuvuk River drainage—1 bull. Unit 26A—that portion of the Colville River drainage upstream from (and including) the Anaktuvuk River drainage—1 moose; however, you may not take a calf or a cow accompanied by a calf.	Aug. 1 - Sept. 14 Feb. 15 - Apr. 15

	Unit 26A—that portion west of 156°00′W. Long. and excluding the Colville River drainage—1 moose; however, you may not take a calf or a cow accompanied by a calf. Unit 26A remainder—1 bull	July 1 - Sept. 14 Augt 1 - Sept. 14
Moose - Residents of Unit 26 (except the Prudhoe Bay-Deadhorse Industrial Complex), Anaktuvuk Pass, and Point Hope	Unit 26B—excluding the Canning River drainage—1 bull.	Sept. 1 - Sept. 14
Moose - Units 26B remainder and 26C	1 moose by Federal registration permit (FM2606) by residents of Kaktovik only. Federal public lands are closed to the taking of moose except by a Kaktovik resident holding a Federal registration permit and hunting under these regulations.	May be announced
Muskox Unit 26A - Residents of Anaktuvuk Pass, Atqasuk, Barrow, Nuiqsut, Point Hope, Point Lay, and Wainwright	Unit 26A	No Federal open season
Muskox Unit 26B—Residents of Anaktuvuk Pass, Kaktovik, and Nuiqsit	Unit 26B	No Federal open season
Muskox Unit 26C—Residents of Kaktovik	Unit 26C—1 bull by Federal registration permit (FX2604) only. The number of permits that may be issued by the Arctic National Wildlife Refuge Manager to the residents of Kaktovik will not exceed three percent (3%) of the number of muskoxen counted in Unit 26C during a pre-calving census. Federal	July 15 - Mar. 31

	public lands are closed to the harvest of muskox, except by residents of Kaktovik.	
Sheep Unit 26A - Residents of Unit 26, Anaktuvuk Pass, and Point Hope	Unit 26A—those portions within the Gates of the Arctic National Park, excluding Anaktuvuk Pass residents—3 sheep Unit 26A—that portion west of Howard Pass and the Etivluk River (DeLong Mountains) by Federal registration permit (FS2607).	Aug. 1 - Apr. 30 May be announced
Sheep Unit 26B—Residents of Unit 26, Anaktuvuk Pass, Point Hope, and Wiseman	Units 26A and 26B—those portions within the Gates of the Arctic National Park, Anaktuvuk Pass residents only—community harvest quota of 60 sheep, no more than 10 of which may be ewes and a daily possession limit of 3 sheep per person, no more than 1 of which may be a ewe.	July 15 - Dec. 31
	Unit 26B—that portion within the Dalton Highway Corridor Management Area—1 ram with ⅞ curl horn or larger by Federal registration permit (FS2602) only.	Aug. 10 - Sept. 20
	Units 26A and 26B remainder (including the Gates of the Arctic National Preserve)—1 ram with ⅞ curl horn or larger.	Aug. 10 - Sept. 20
Sheep Unit 26C—Residents of Unit 26, Anaktuvuk Pass, Arctic Village, Chalkyitsik, Fort Yukon, Point Hope, and Venetie	Unit 26C—3 sheep per regulatory year; the Aug. 10 - Sept. 20 season is restricted to 1 ram with ⅞ curl horn or larger. A Federal registration permit (FS2603) is required for the Oct. 1 - Apr. 30 season.	Aug. 10 - Sept. 20 Oct. 1 - Apr. 30
Coyote - All rural residents	2 coyotes	Sept. 1 - Apr. 30
Fox, Arctic - All rural residents	2 foxes	Sept. 1 - Apr. 30

Fox, Red - All rural residents	Units 26A and 26B - 10 foxes; however, no more than 2 foxes may be taken prior to Oct. 1	Sept. 1 - Mar. 15
Fox, Red - All rural residents	Unit 26C - 10 foxes	Nov. 1 - Apr. 15
Hare - All rural residents	No limit	July 1 - June 30
Lynx - All rural residents	2 lynx	Nov. 1 - Apr. 15
Wolf - Residents of Units 6, 9, 10 (Unimak Island only), 11, 12, 13, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, and Chickaloon	15 wolves	Aug. 10 - Apr. 30
Wolverine - All rural residents	5 wolverine	Sept. 1 - Mar. 31
Ptarmigan - All rural residents	20 ptarmigan per day, 40 in possession	Aug 10 - Apr. 30
Migratory Bird Hunting Seasons & Limits		
Species	**Limit**	**Season**
Ducks (except sea ducks)	10 per day, 30 in possession No more than 2 canvasback per day, 6 in possession	Sept. 1 - Dec. 16
SEA DUCKS: Include harlequin duck, long-tailed duck (oldsquaw); common, king, Steller's and spectacled eider; surf, black and white-winged scoter; and common and red-breasted merganser. Steller's and spectacled eiders are closed statewide. For purposes of these regulations, bufflehead and goldeneyes (Barrow's and common) are not considered sea ducks.	10 per day, 20 in possession no more than 6 per day, 12 in possession of harlequin ducks and no more than 6 per day, 12 in possession of long-tailed ducks Steller's and spectacled eiders are closed statewide	Sept. 1 - Dec. 16
Canada Geese include any combination of Cackling or Canada geese. White geese include snow and Ross's geese	4 per day, 12 in possession	Sept. 1 - Dec. 16
White-fronted Geese	4 per day, 12 in possession	Sept. 1 - Dec. 16
White Geese	6 per day, 18 in possession	Sept. 1 - Dec. 16
Brant	3 per day, 9 in possession	Sept. 1 - Dec. 16
Emperor Geese	1 per season	Sept. 1 - Dec. 16
Common Snipe	8 per day, 24 in possession	Sept. 1 - Dec. 16
Sandhill Cranes	3 per day, 9 in possession	Sept. 1 - Dec. 16
FALCONRY: A falconry permit is required to take, possess or hunt with an		

authorized species of raptor. Total combined limits for all migratory game birds taken by falconry are 3 per day, 9 in possession.		
Subsistence Migratory Bird Harvest Seasons & Limits (Apr 2 – Aug 31)		
Species	**Limit**	**Season**
Waterfowl - Greater White-fronted Goose, Snow Goose, Emperor Goose, Lesser Canada Goose, Aleutian Canada Goose, Cackling Canada Goose, Black Brant (no egg gathering), Tundra Swan, Gadwall, Eurasian Wigeon, American Wigeon, Mallard, Blue-winged Teal, Northern Shoveler, Northern Pintail, Green-winged Teal, Canvasback, Redhead, Ring-necked Duck, Greater Scaup, Lesser Scaup, King Eider, Common Eider, Harlequin Duck, Surf Scoter, White-winged Scoter, Black Scoter, Long-tailed Duck, Bufflehead, Common Goldeneye, Barrow's Goldeneye, Hooded Merganser, Common Merganser, Red-breasted Merganser		April 2 - June 19 and July 20 - August 31 (Closure June 20 - July 29)
Waterbirds - Red-throated Loon, Arctic Loon, Pacific Loon, Common Loon, Horned Grebe, Red-necked Grebe, Yellow-billed Loon - limited opportunity for birds inadvertently entangled in fishing gill nets		April 2 - June 19 and July 20 - August 31 (Closure June 20 - July 29)
Shorebirds - Black-bellied Plover, Common Ringed Plover, Black Oystercatcher, Greater Yellowlegs, Lesser Yellowlegs, Spotted Sandpiper, Ruddy Turnstone,		April 2 - June 19 and July 20 - August 31 (Closure June 20 - July 29)

Long-billed Dowitcher, Bar-tailed Godwit, Semipalmated Sandpiper, Western Sandpiper, Least Sandpiper, Baird's Sandpiper, Sharp-tailed Sandpiper, Dunlin, Wilson's Snipe, Red Phalarope, Red-necked phalarope		
Seabirds - Northern Fulmar, Double-crested Cormorant, Pelagic Cormorant, Pomarine Jaeger, Parasitic Jaeger, Long-tailed Jaeger, Bonaparte's Gull, Mew Gull, Herring Gull, Slaty-backed Gull, Glaucous-winged Gull, Glaucous Gull, Sabine's Gull, Black-legged Kittiwake, Red-legged Kittiwake, Ivory Gull, Arctic Tern, Aleutian Tern, Common Murre, Thick-billed Murre, Black Guillemot, Pigeon Guillemot, Cassin's Auklet, Parakeet Auklet, Least Auklet, Whiskered Auklet, Crested Auklet, Rhinoceros Auklet, Horned Puffin, Tufted Puffin		April 2 - June 19 and July 20 - August 31 (Closure June 20 - July 29)
Other - Cranes, Sandhill Crane Owls, Great Horned Owl, Snowy Owl Emperor Geese - are now open for hunting and egg gathering statewide Cackling Canada Geese - Egg gathering is now open statewide		April 2 - June 19 and July 20 - August 31 (Closure June 20 - July 29)
Alaska State Sport Fishing Seasons & Limits (Fresh Water)		
Species	**Limit**	**Season**
King Salmon	20 inches or longer - 3 per day, 3 in possession only two of which may be 28 inches or longer	The fishing season for all species is open year-round unless otherwise noted below or in Special Regulations.
	Less than 20 inches - 10 per day, 10 in possession	

Other Salmon	10 per day, 10 in possession, no size limit	
Arctic Grayling	5 per day, 5 in possession, no size limit	
Sheefish	10 per day, 10 in possession, no size limit	
Arctic Char, Dolly Varden, & Lake Trout	All lakes: 2 per day, 2 in possession - in combination, no size limit	
	Flowing and salt waters: 10 per day, 10 in possession - only two of which may be 20 inches or longer and only 2 may be lake trout	
Northern Pike	10 per day, 10 in possession, no size limit	
Burbot	15 per day, 15 in possession, no size limit	
Other finfish	No limit	
Alaska State Sport Fishing Seasons & Limits (Salt Water)		
Species	**Limit**	**Season**
Red King Crab	Males only - 6 per day, 6 in possession - 4 ¾ inches or more	The fishing season for all species is open year-round unless otherwise noted below or in Special Regulations.
Blue King Crab	Males only - 6 per day, 6 in possession - 4 ¾ inches or more	
Dungeness Crab	Males only - 12 per day, 12 in possession, 6 ½ inches or more	
Tanner Crab	Males only: - *C. bairdi,* 5 ½ inches or more - *C. opilio*, 3 ⅛ inches or more 12 per day, 12 in possession (in combination)	
Alaska State Trapping Seasons & Limits		
Species	**Limit**	**Season**
Beaver 26C		No open season
Coyote 26B & 26C	No limit	Nov 1 - Apr. 15
Arctic Fox 26B & 26C	No limit	Nov 1 - Apr. 15
Red Fox 26B & 26C	No limit	Nov 1 - Apr. 15

Lynx 26B & 26C	No limit	Nov 1 - Apr. 15
Marten 26B & 26C	No limit	Nov 1 - Apr. 15
Muskrat 26B & 26C	No limit	Nov 1 - Jun. 10
River Otter 26B & 26C	No limit	Nov 1 - Apr. 15
Squirrel 26B & 26C	No limit	No closed season
Wolf 26B & 26C	No limit	Nov 1 - Apr. 30
Wolverine 26B & 26C	No limit	Nov 1 - Apr. 15
Federal Subsistence Fishing Seasons & Limits (Federal waters only)		
Species	**Limit**	**Season**
Salmon, other than Fall Chum Salmon	No Limit	As scheduled
Fall Chum Salmon	No Limit	As scheduled
Freshwater Species (other than Salmon) including Sheefish, Whitefish, Lamprey, Burbot, Sucker, Grayling, Pike, Char, and Blackfish	Grayling — Mouth of Nome Creek downstream to confluence of O'Brien Creek, the daily subsistence harvest and possession limit is 5 grayling; –Mouth of O'Brien Creek downstream to the confluence of Moose Creek, the daily subsistence harvest and possession limit is 10 grayling; –Nome Creek drainage is closed to fishing for grayling. Other Species- no limit	Year round Year round
Yukon River Drainage remainder - residents of the Yukon-Northern Area, except for the those living in Unit 26B and the residents of the Yukon River drainage	No limit	Year round
Residents of the Yukon-Northern Area, except for those living in Unit 26B and the residents of the Yukon River drainage.	No limit	Year round

Evaluation:

Other Alternatives & Available Lands:

Finding:

U.S. Fish and Wildlife Service
1011 East Tudor Road
Anchorage, AK 99503